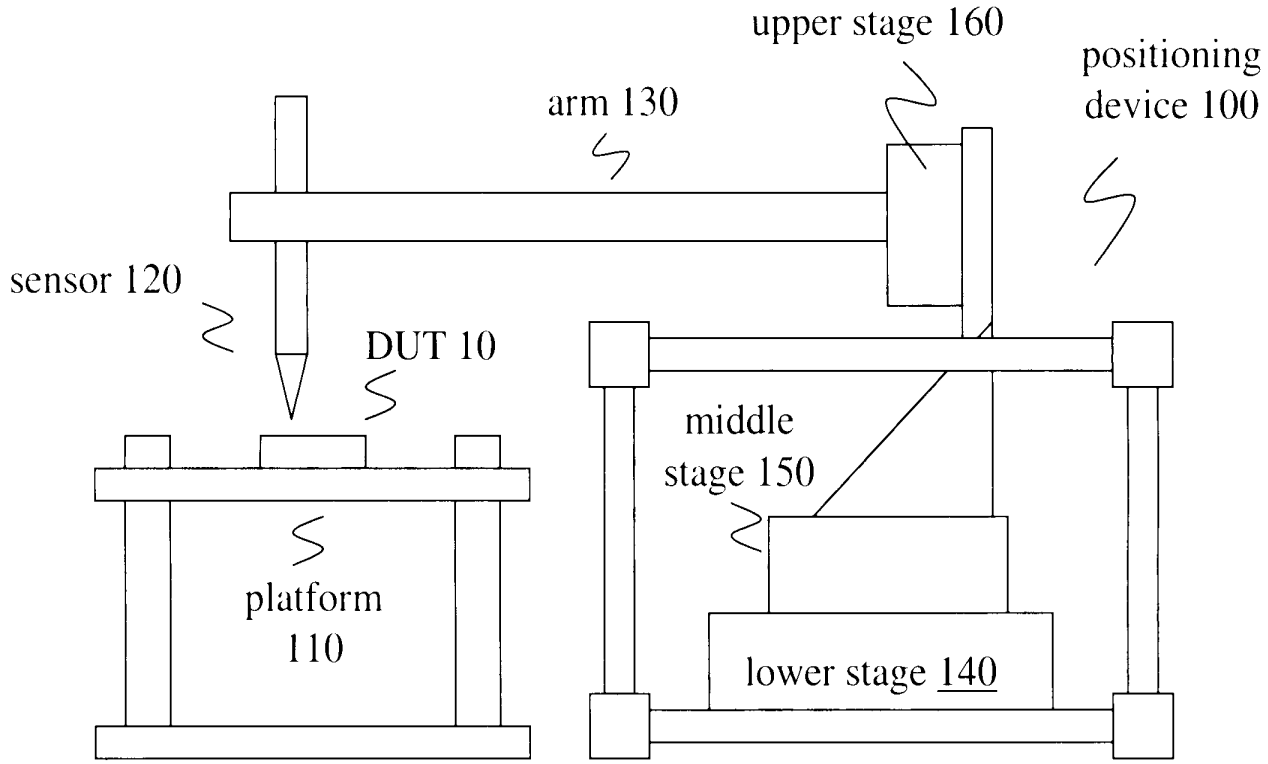

upper stage 160
positioning device 100
arm 130
sensor 120
DUT 10
middle stage 150
platform 110
lower stage 140

FIG. 1

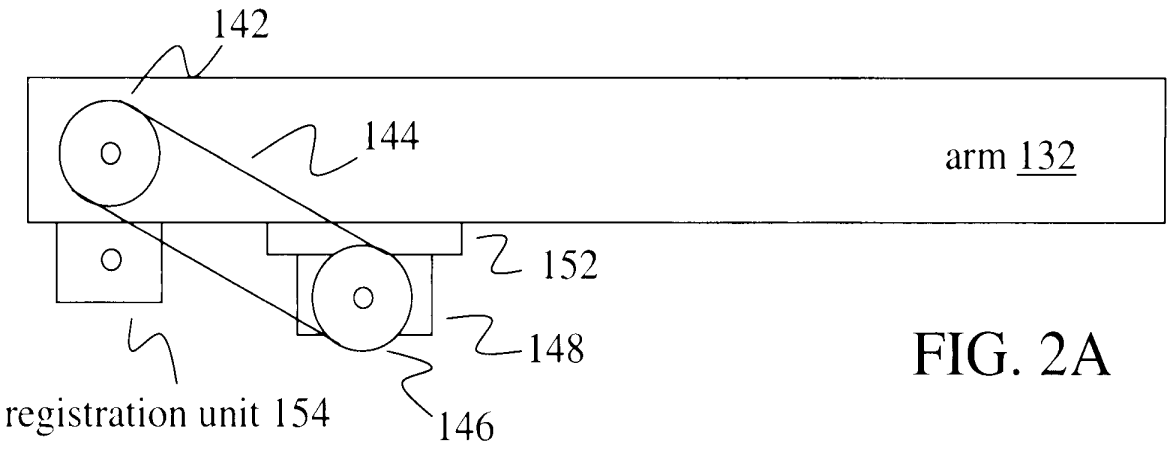

142
144
arm 132
152
148
registration unit 154
146

FIG. 2A

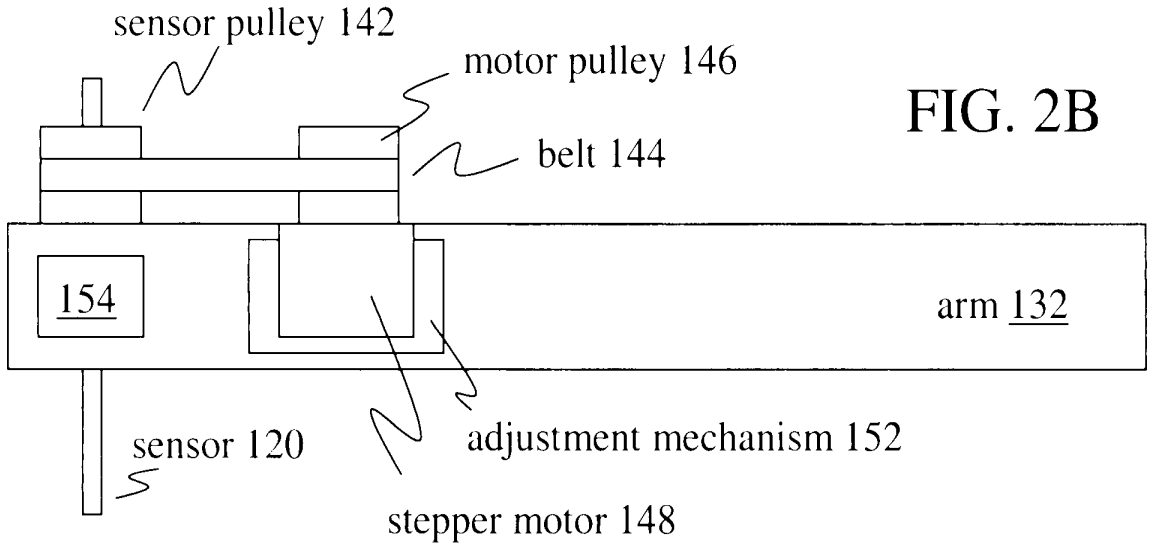

sensor pulley 142
motor pulley 146
belt 144
154
arm 132
sensor 120
adjustment mechanism 152
stepper motor 148

FIG. 2B

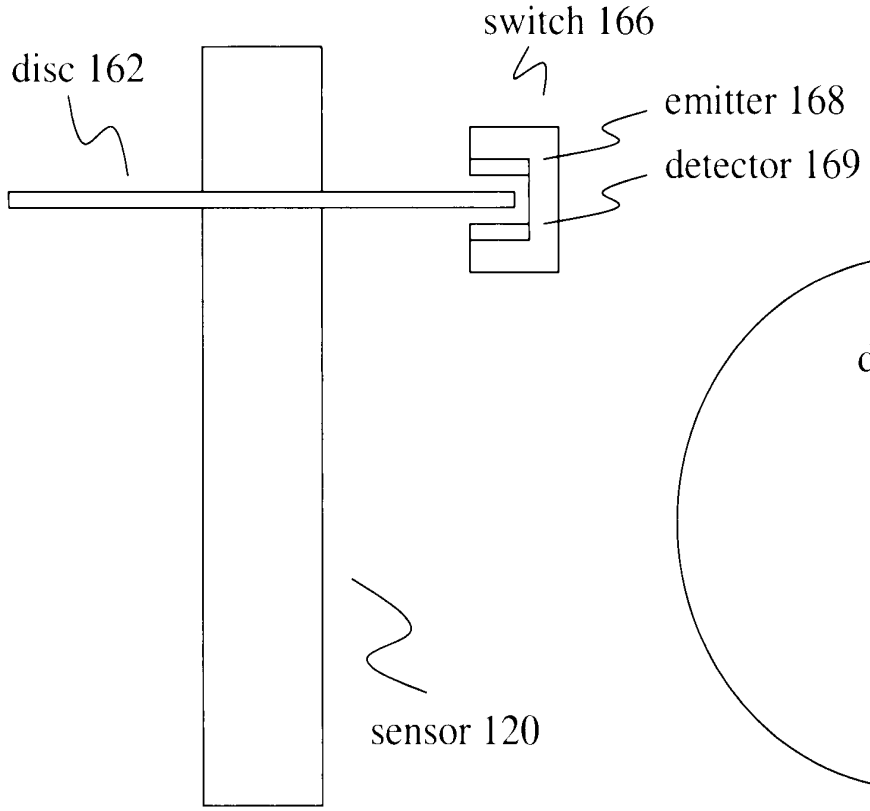

switch 166
disc 162
emitter 168
detector 169
sensor 120

FIG. 3A

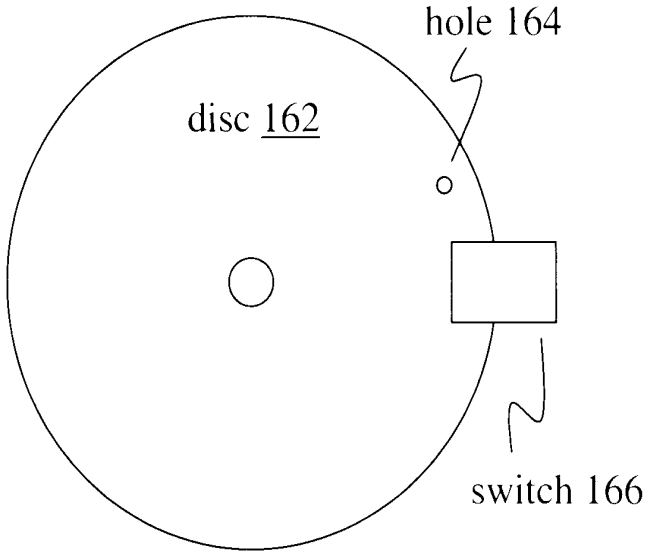

hole 164
disc 162
switch 166

FIG. 3B

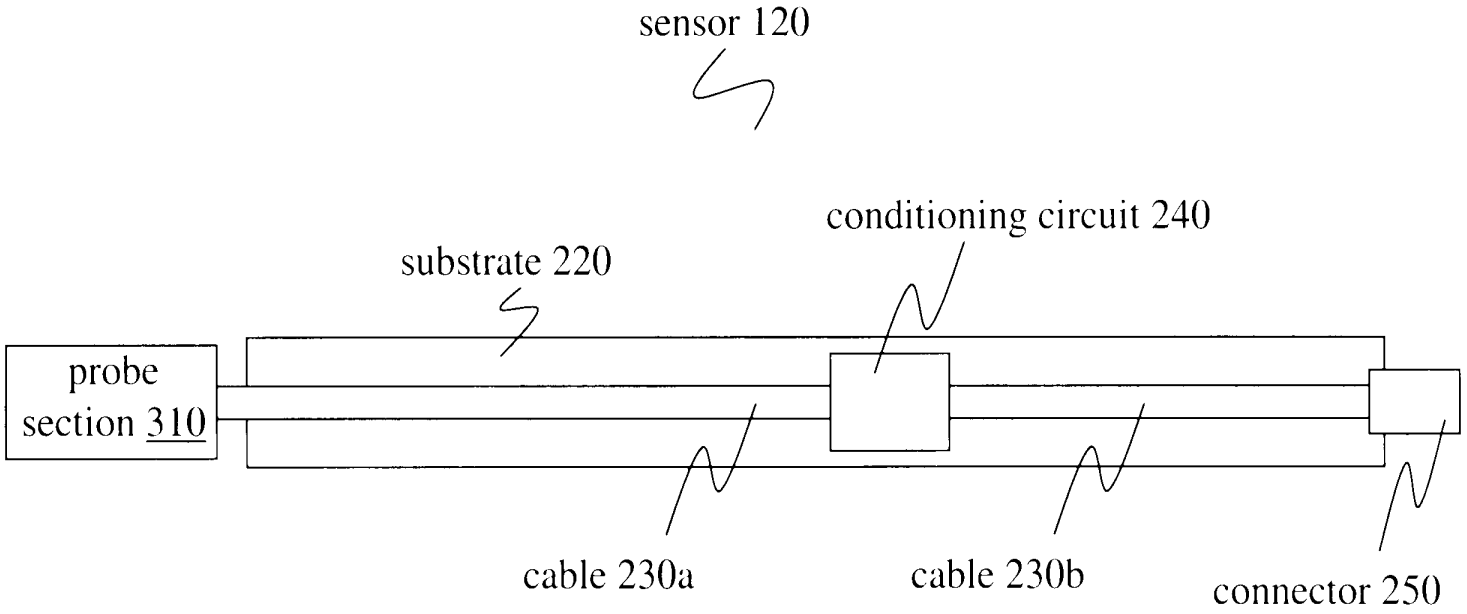

sensor 120
conditioning circuit 240
substrate 220
probe
section 310
cable 230a
cable 230b
connector 250

FIG. 4

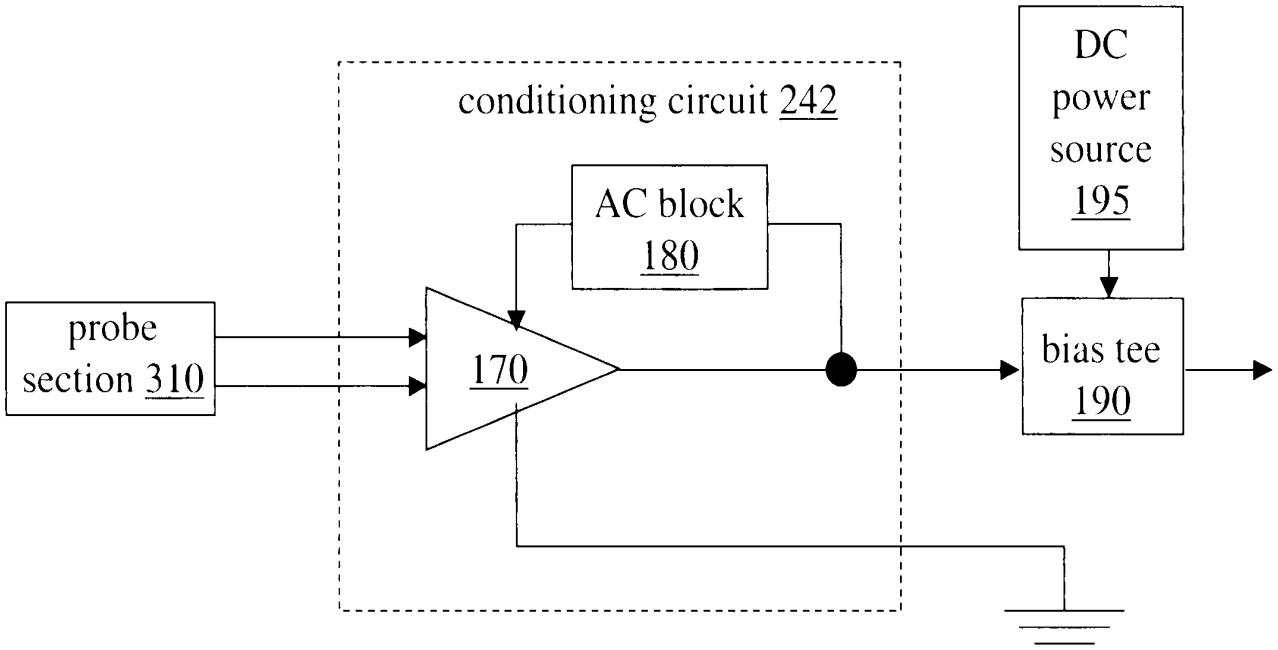

conditioning circuit 242
AC block
180
DC
power
source
195
probe
section 310
170
bias tee
190

FIG. 5

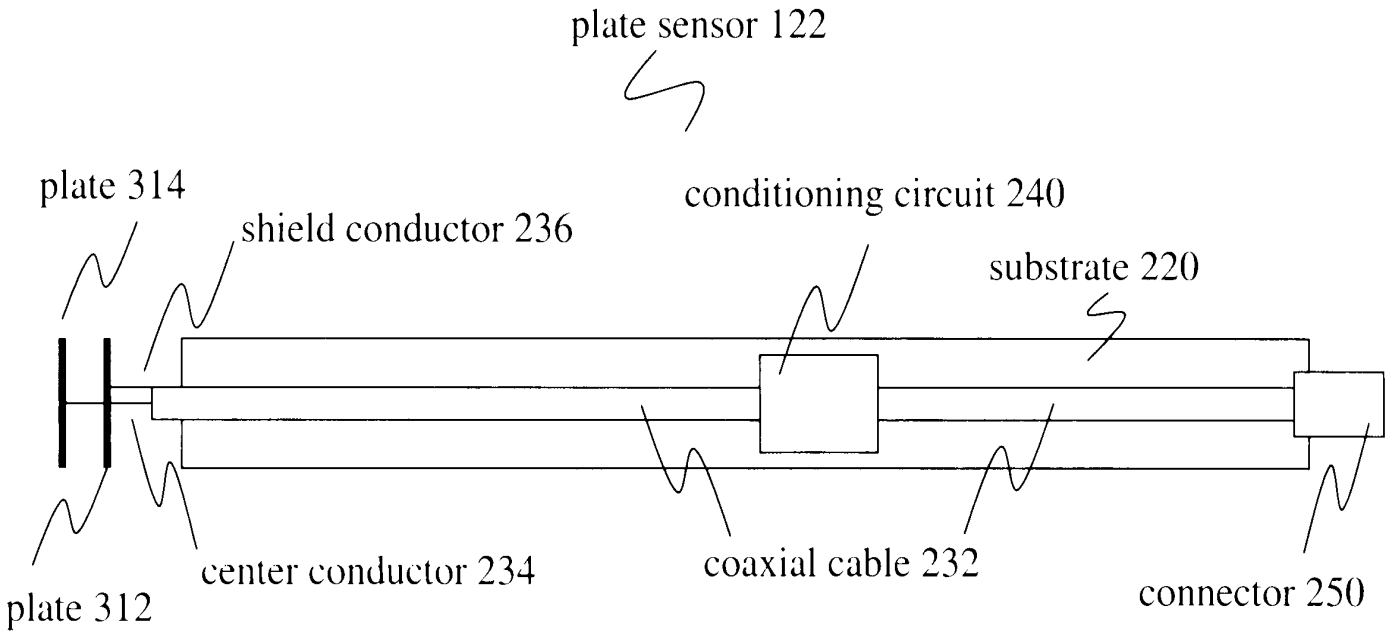


plate sensor 122
plate 314
shield conductor 236
conditioning circuit 240
substrate 220
plate 312
center conductor 234
coaxial cable 232
connector 250

FIG. 6

FIG. 7A

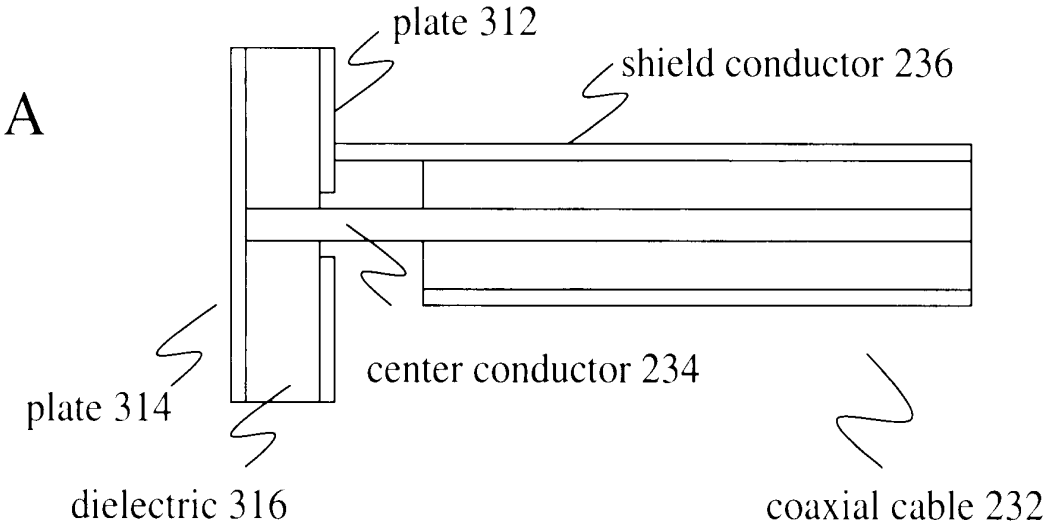


plate 312
shield conductor 236
plate 314
center conductor 234
dielectric 316
coaxial cable 232

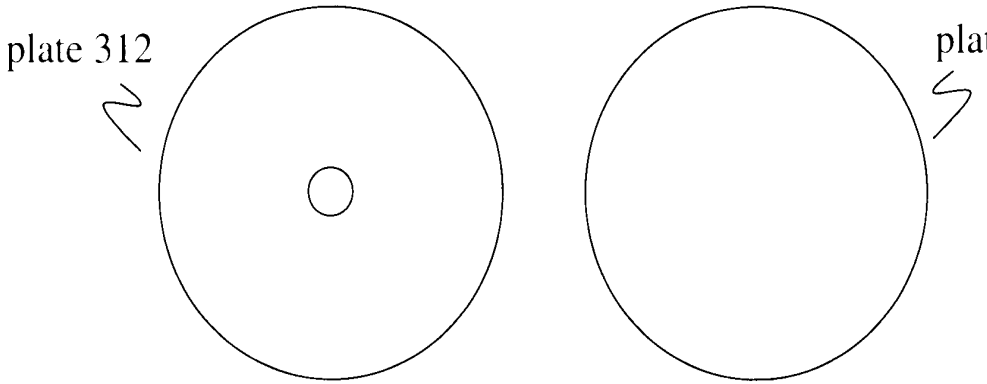


plate 312
plate 314

FIG. 7B

FIG. 8

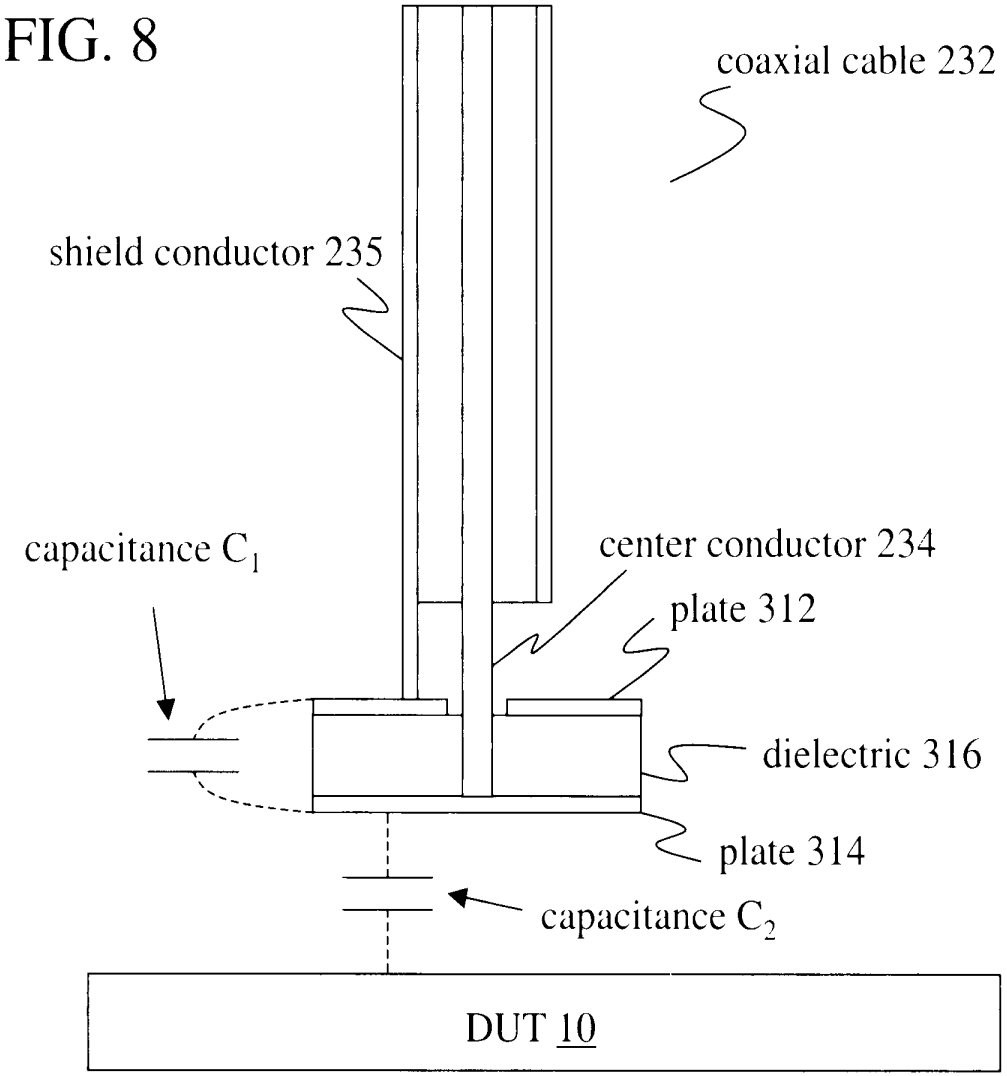

coaxial cable 232
shield conductor 235
capacitance C_1
center conductor 234
plate 312
dielectric 316
plate 314
capacitance C_2
DUT 10

FIG. 9A

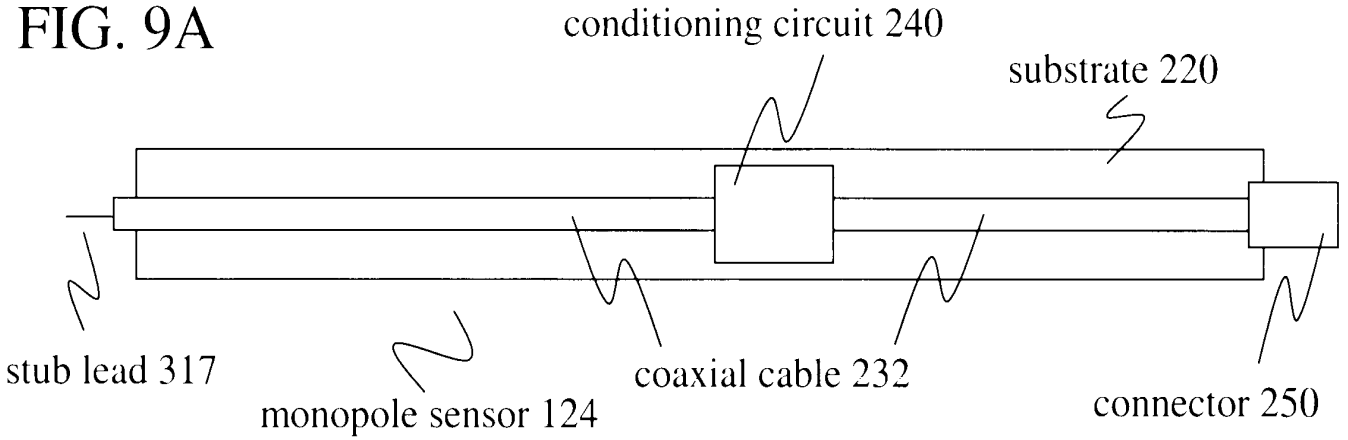

conditioning circuit 240
substrate 220
stub lead 317
monopole sensor 124
coaxial cable 232
connector 250

FIG. 9B

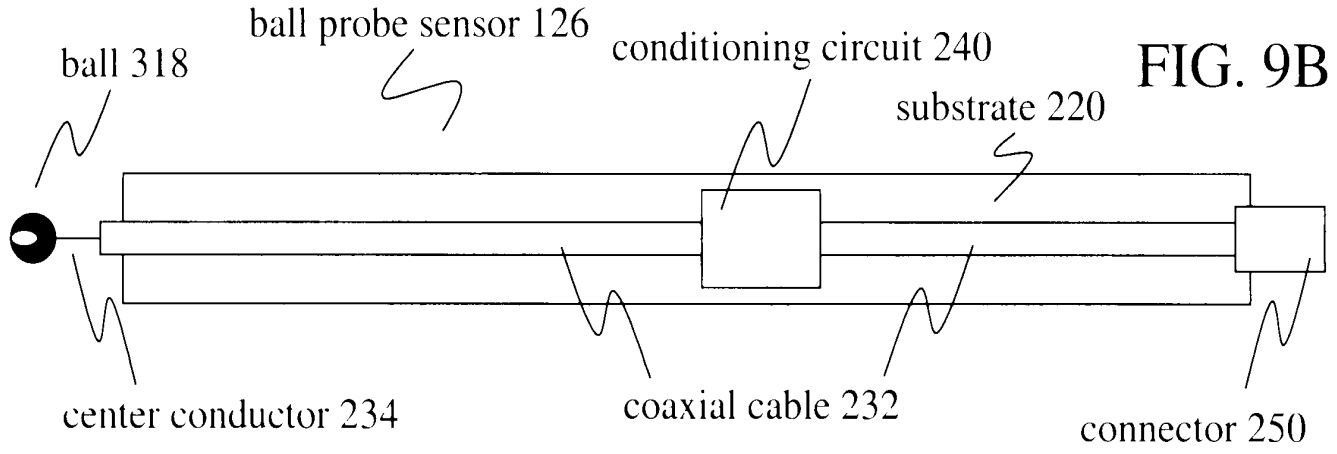
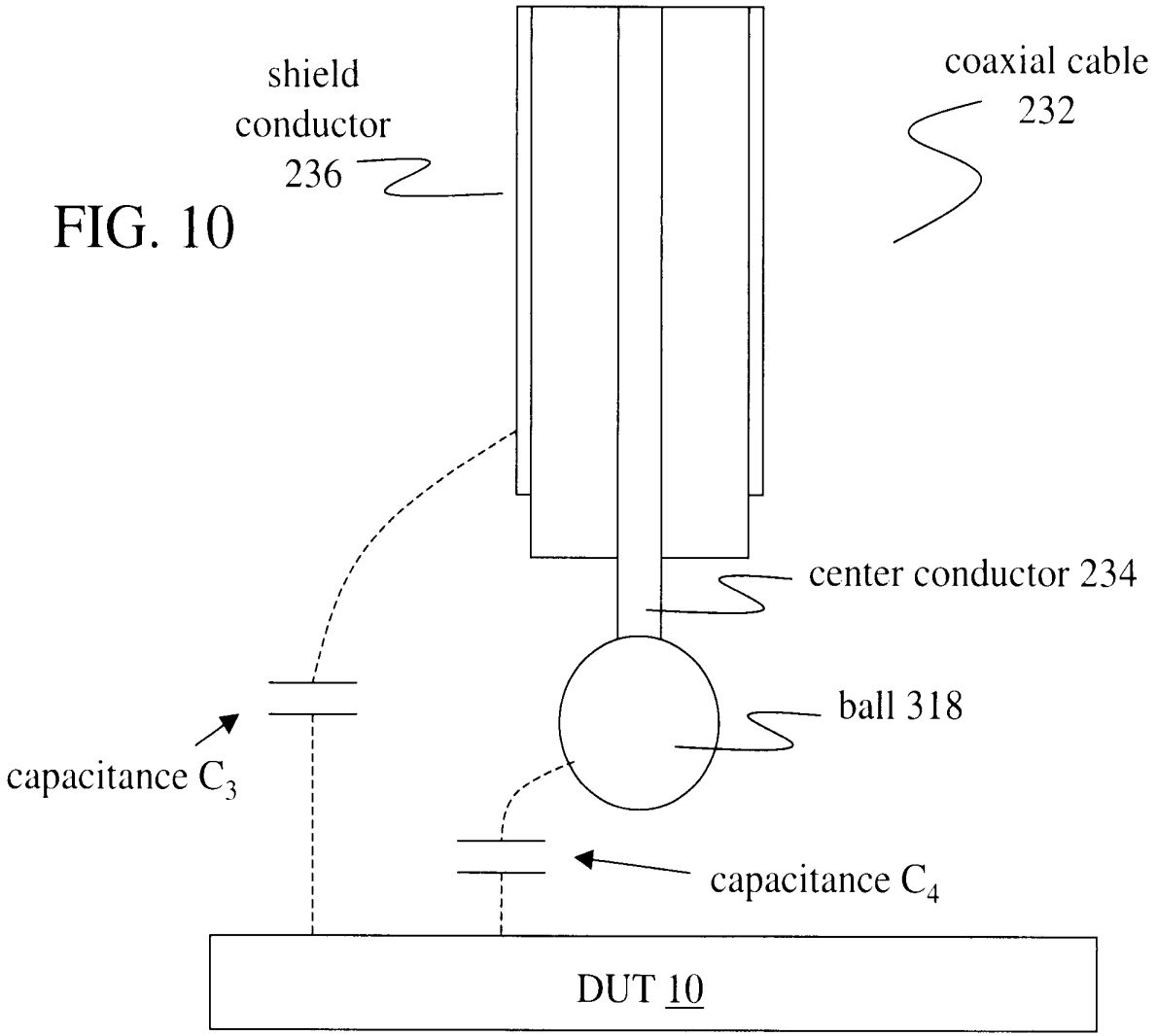

ball probe sensor 126
conditioning circuit 240
ball 318
substrate 220
center conductor 234
coaxial cable 232
connector 250

FIG. 10


shield
conductor
236
coaxial cable
232
center conductor 234
ball 318
capacitance C_3
capacitance C_4
DUT 10

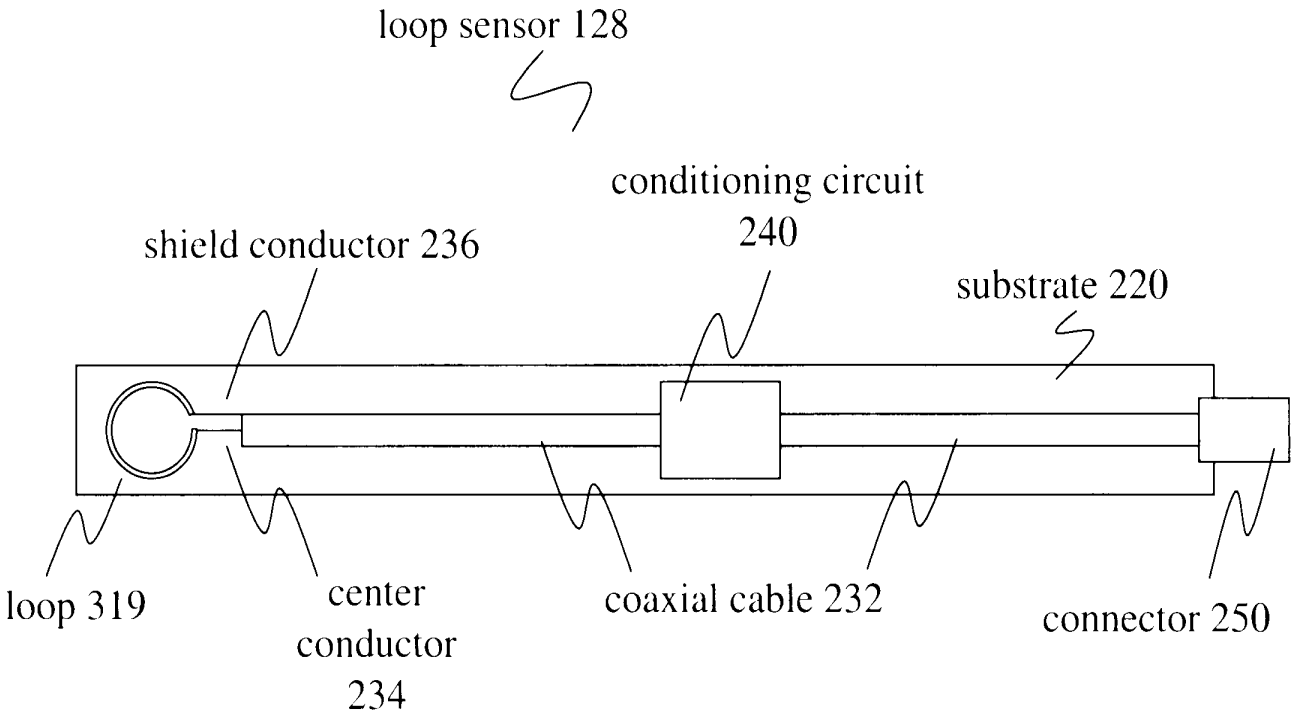

loop sensor 128
conditioning circuit 240
shield conductor 236
substrate 220
loop 319
center conductor 234
coaxial cable 232
connector 250

FIG. 11

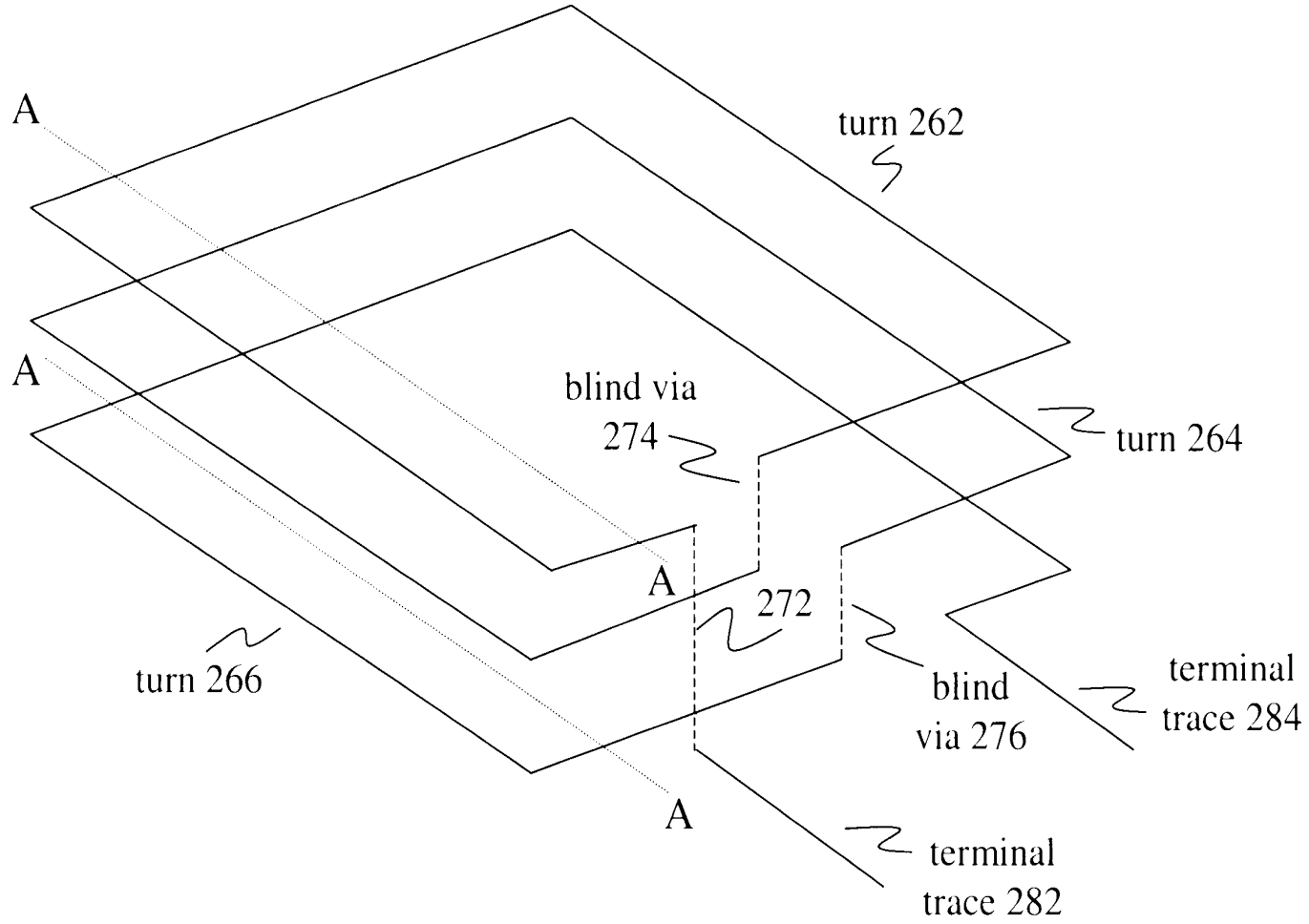

A
turn 262
A
blind via
274
turn 264
A
272
turn 266
blind
via 276
terminal
trace 284
A
terminal
trace 282

FIG. 12

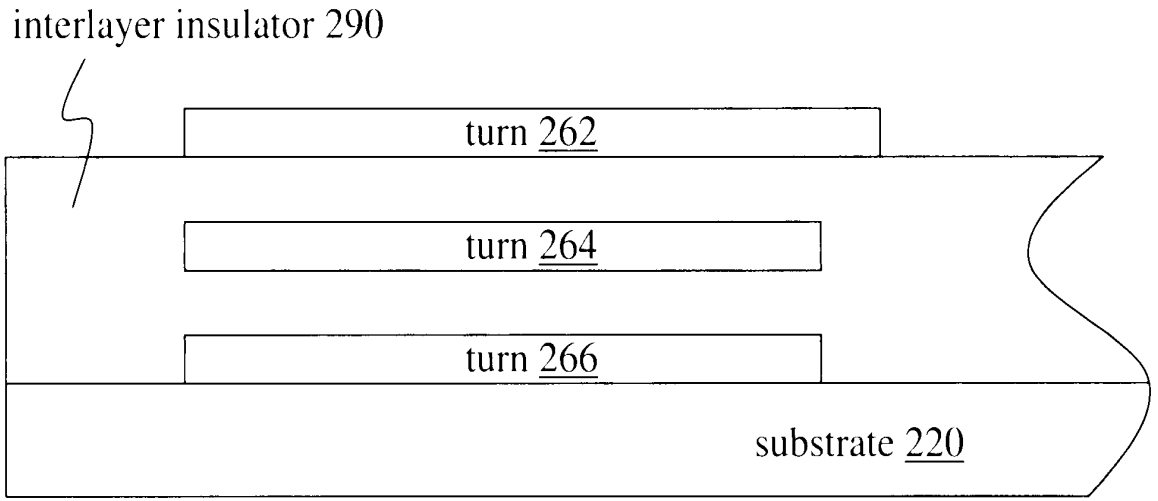

interlayer insulator 290
turn 262
turn 264
turn 266
substrate 220

FIG. 13

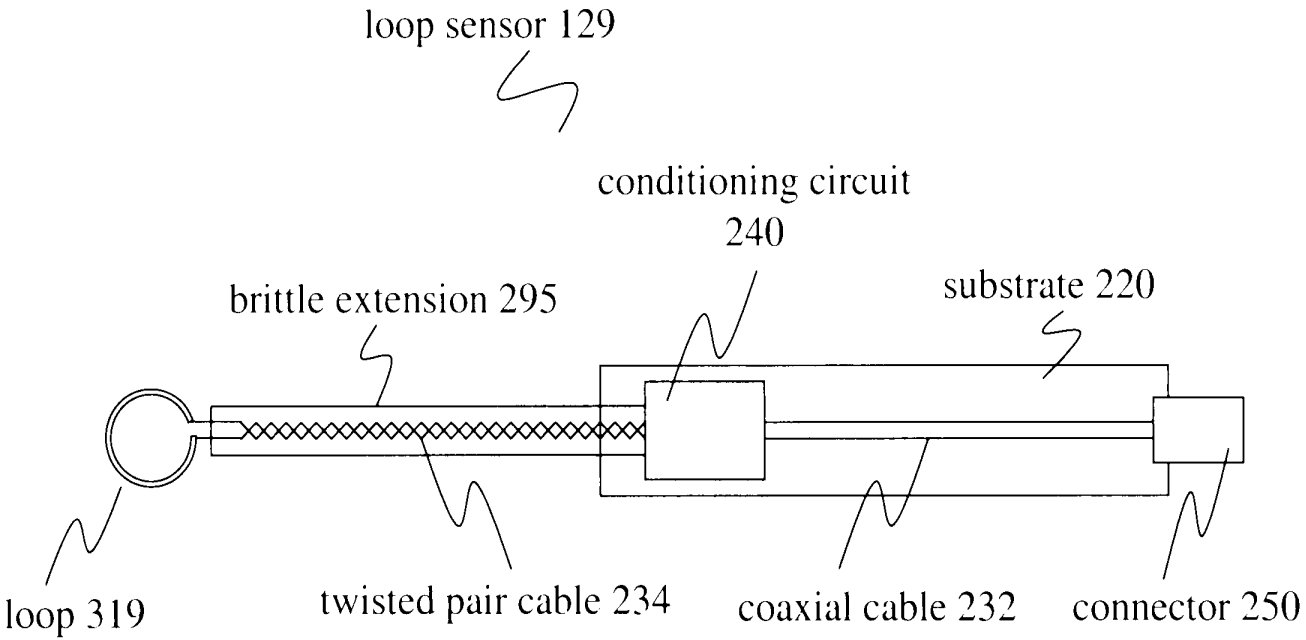

loop sensor 129
conditioning circuit
240
brittle extension 295
substrate 220
loop 319
twisted pair cable 234
coaxial cable 232
connector 250

FIG. 14

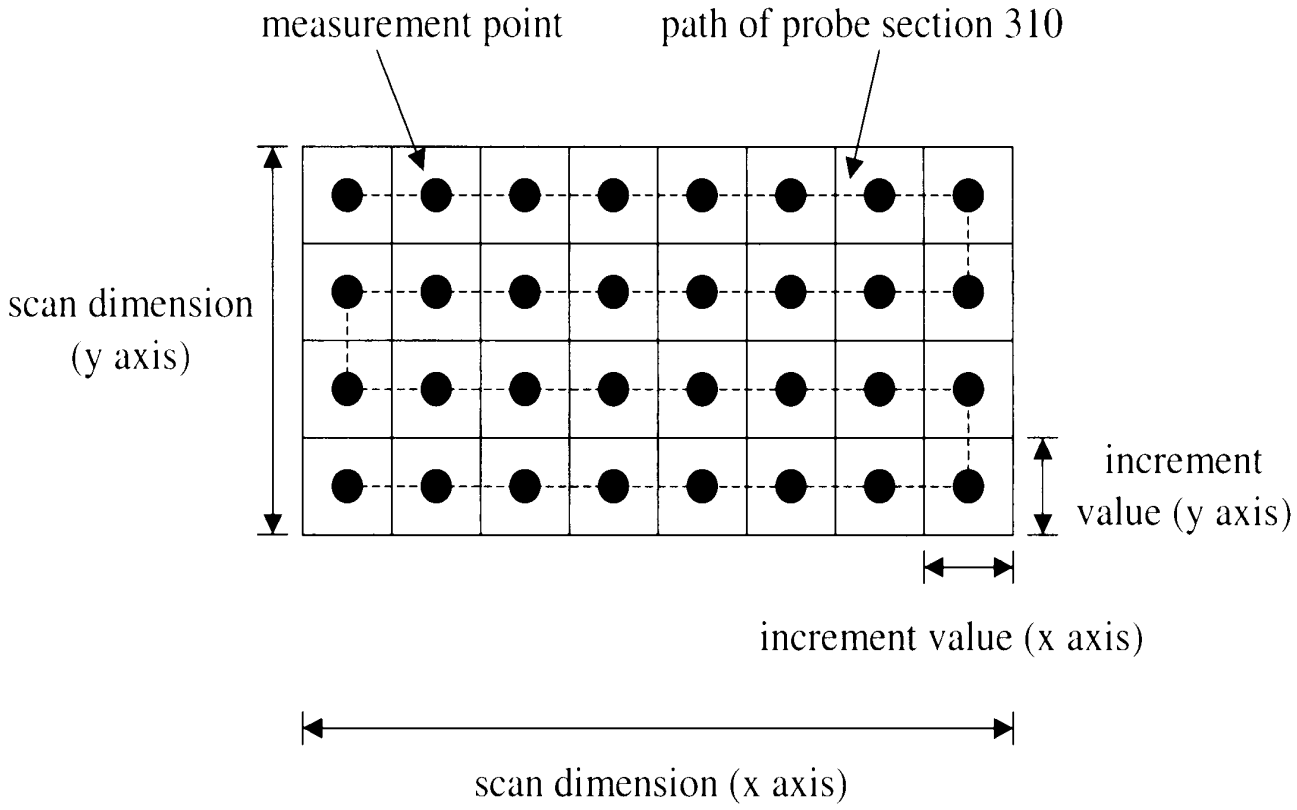

measurement point
path of probe section 310
scan dimension
(y axis)
increment
value (y axis)
increment value (x axis)
scan dimension (x axis)

FIG. 15

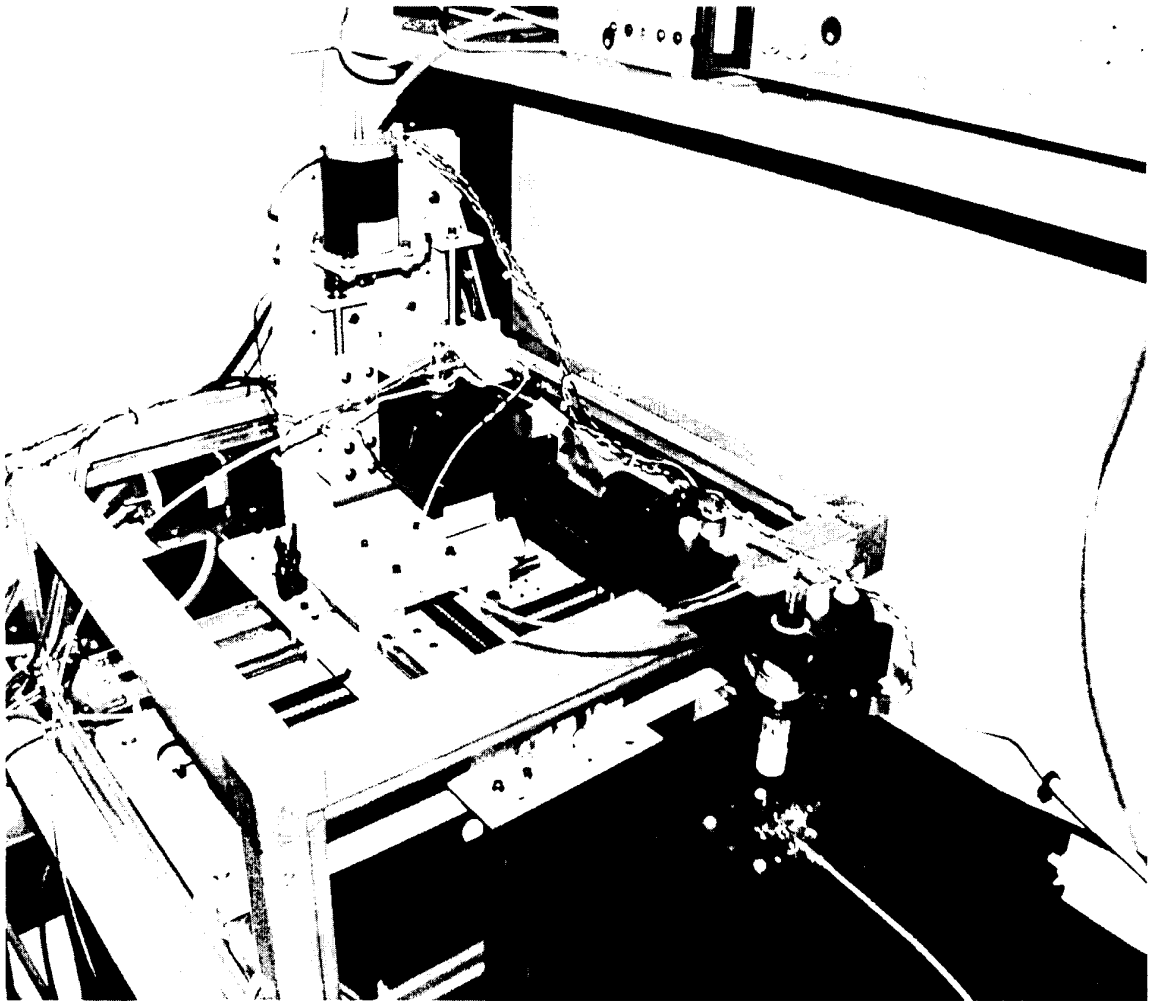


FIG. 16

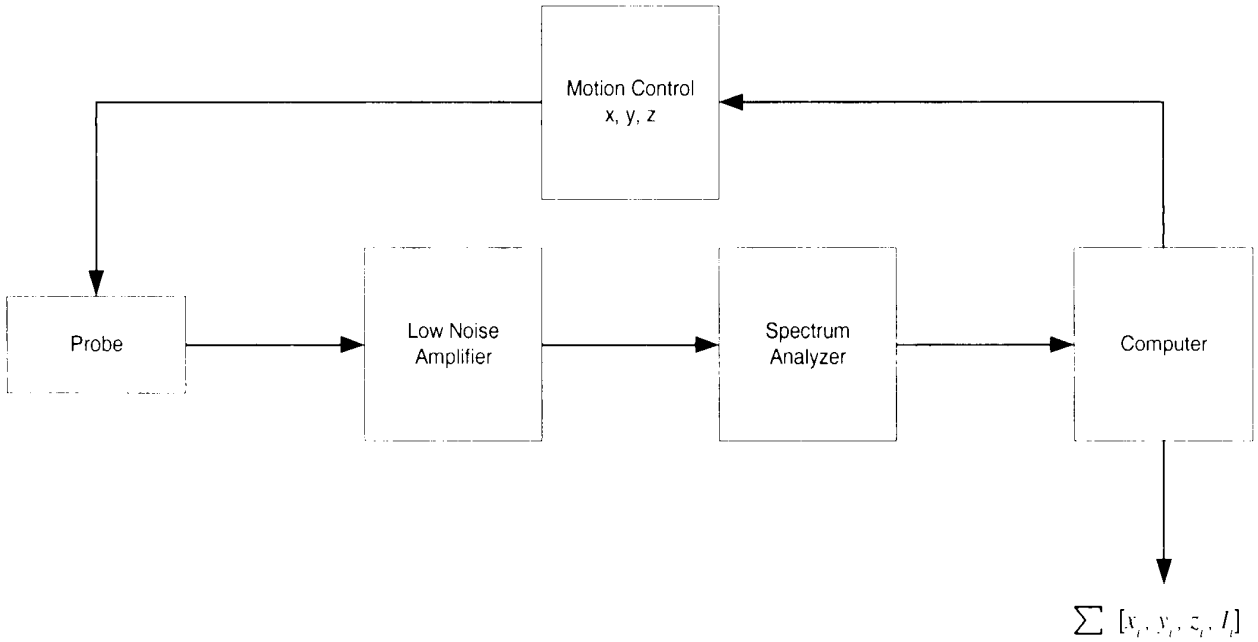

Motion Control
x, y, z
Probe
Low Noise
Amplifier
Spectrum
Analyzer
Computer
$\sum [x_i, y_i, z_i, I_i]$

FIG. 17

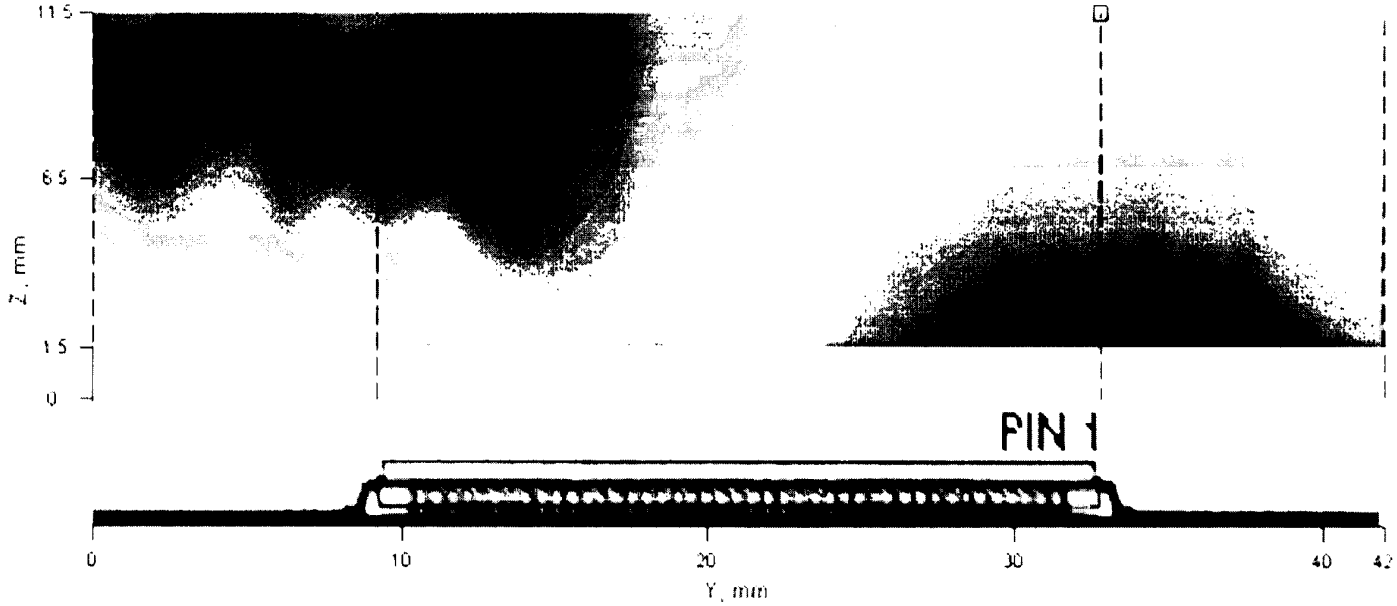


FIG. 18

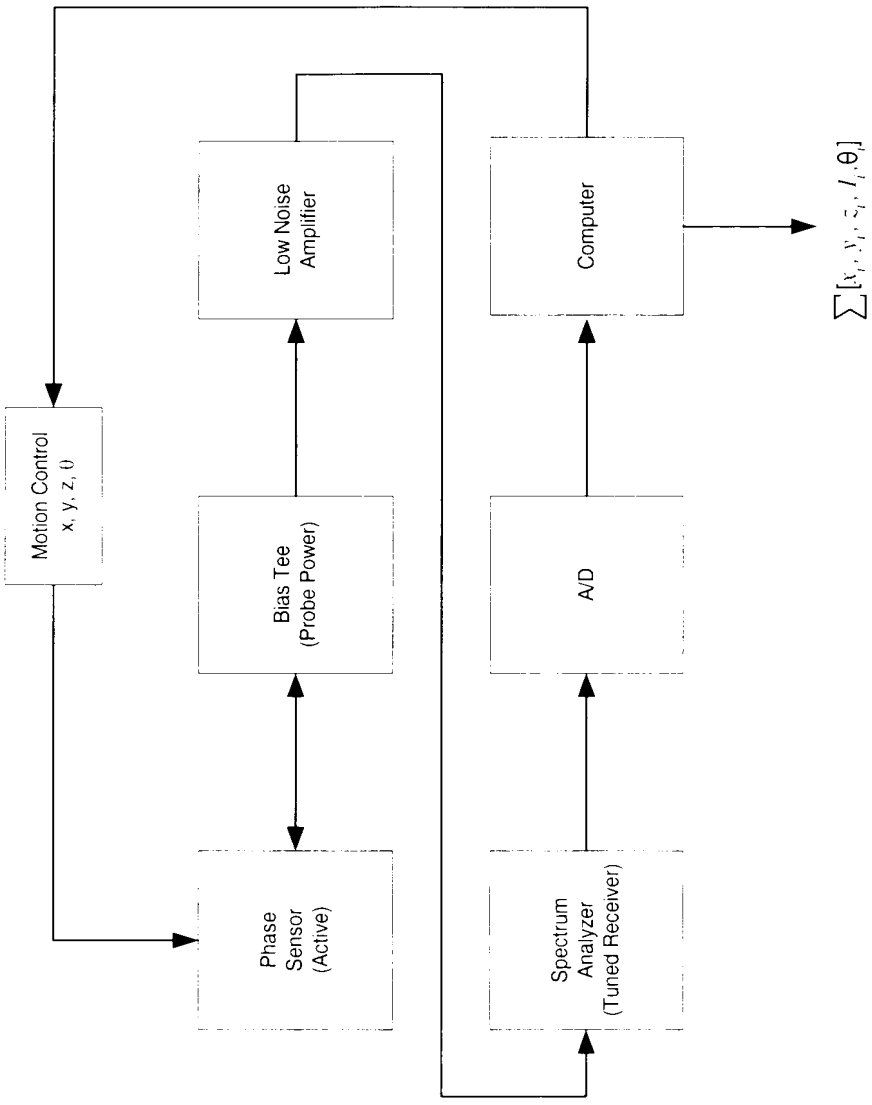

Motion Control
x, y, z, θ
Phase
Sensor
(Active)
Bias Tee
(Probe Power)
Low Noise
Amplifier
Spectrum
Analyzer
(Tuned Receiver)
A/D
Computer
$\sum[x_i, y_i, z_i, I_i, \theta_i]$

FIG. 19

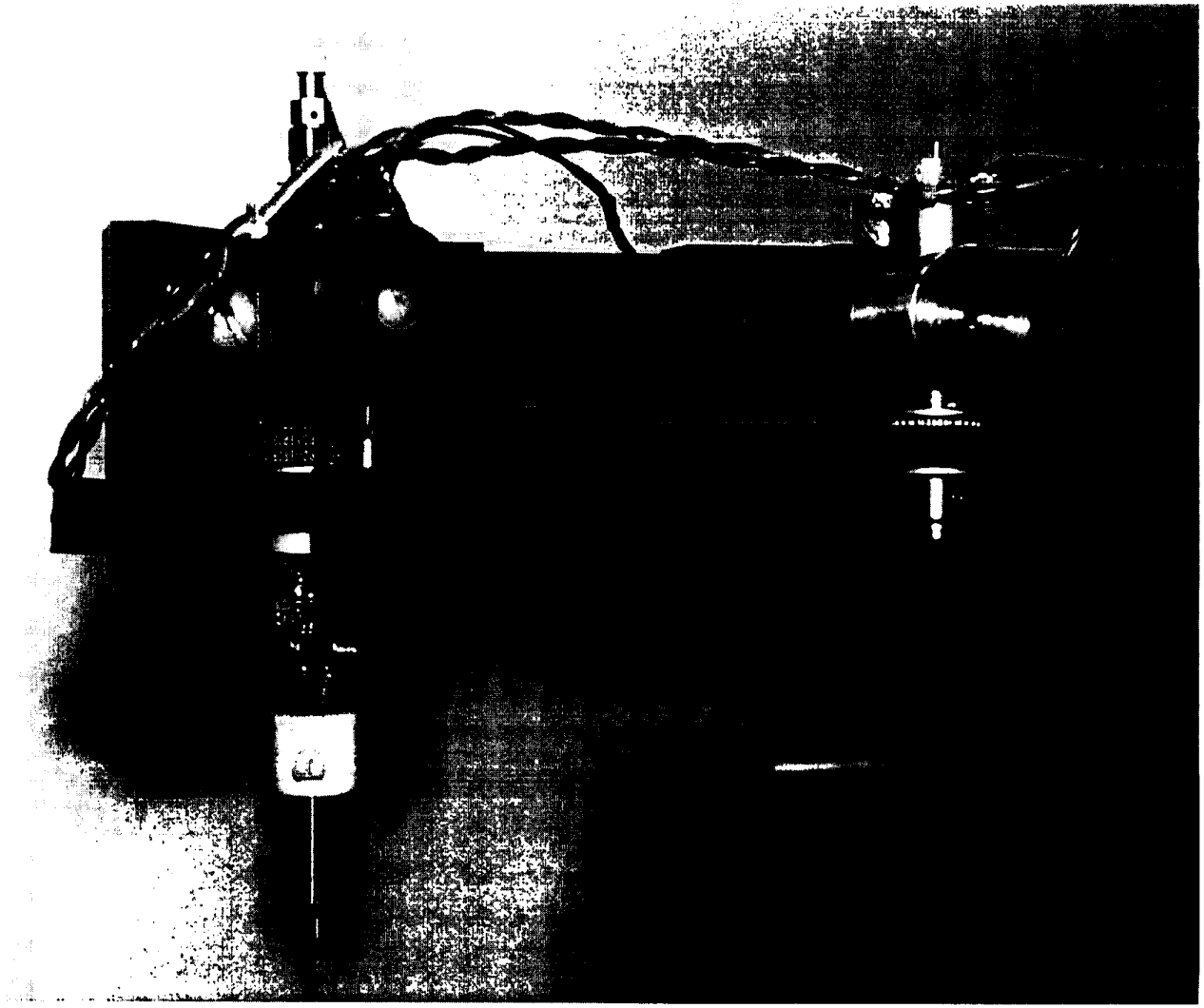


FIG. 20

11/16/99 - Micro stripline is terminated in 50 ohms. Frequency: 1000 MHz
Probe Type: Magnetic Field. Measurement Increments: dx: 1.94 mm, dy: 1.97 mm, dz: 0 mm
Number of Planes: 1, at 14.52 mm above DUT. Magnetic Field Intensity Unit: dB uA/m.

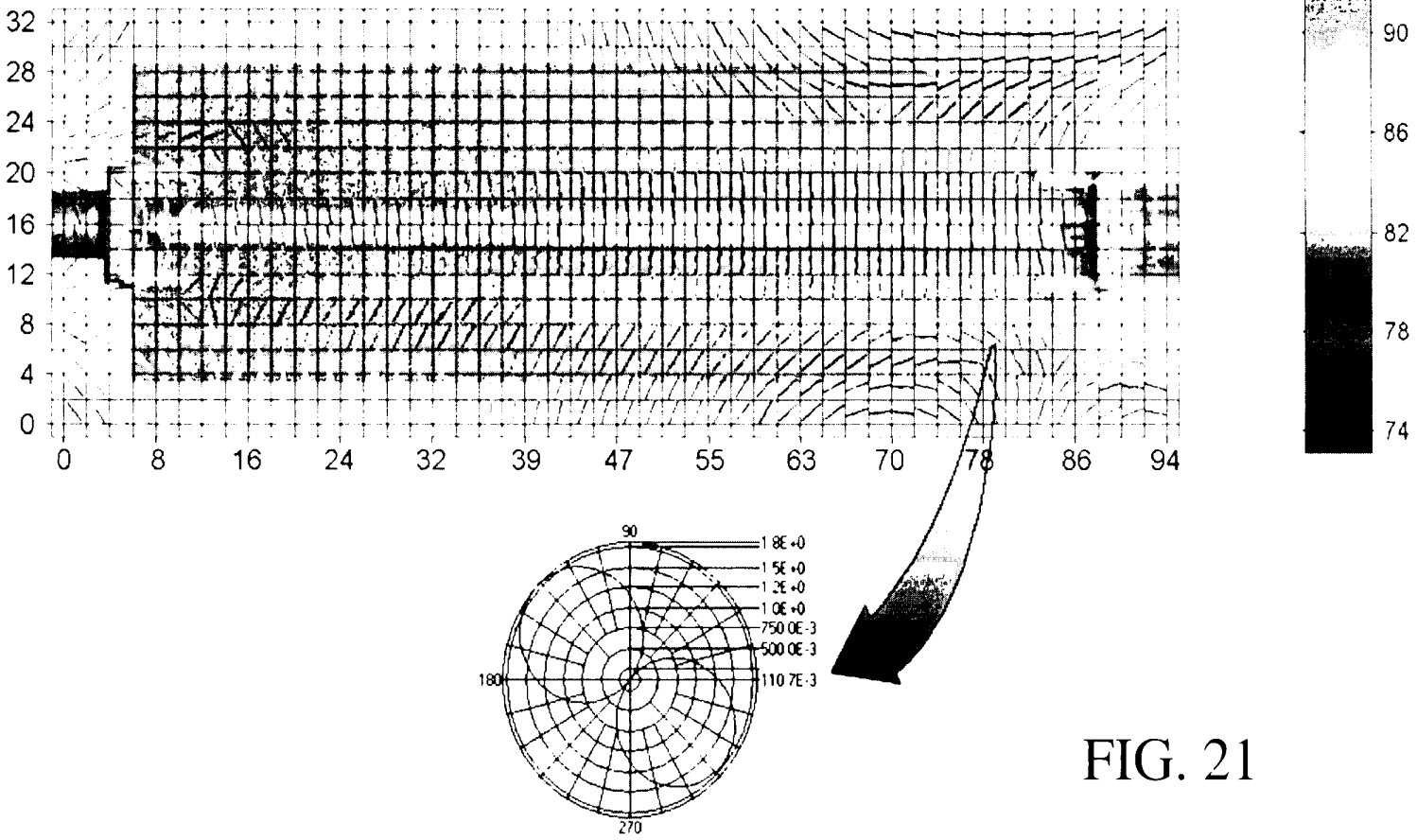


FIG. 21

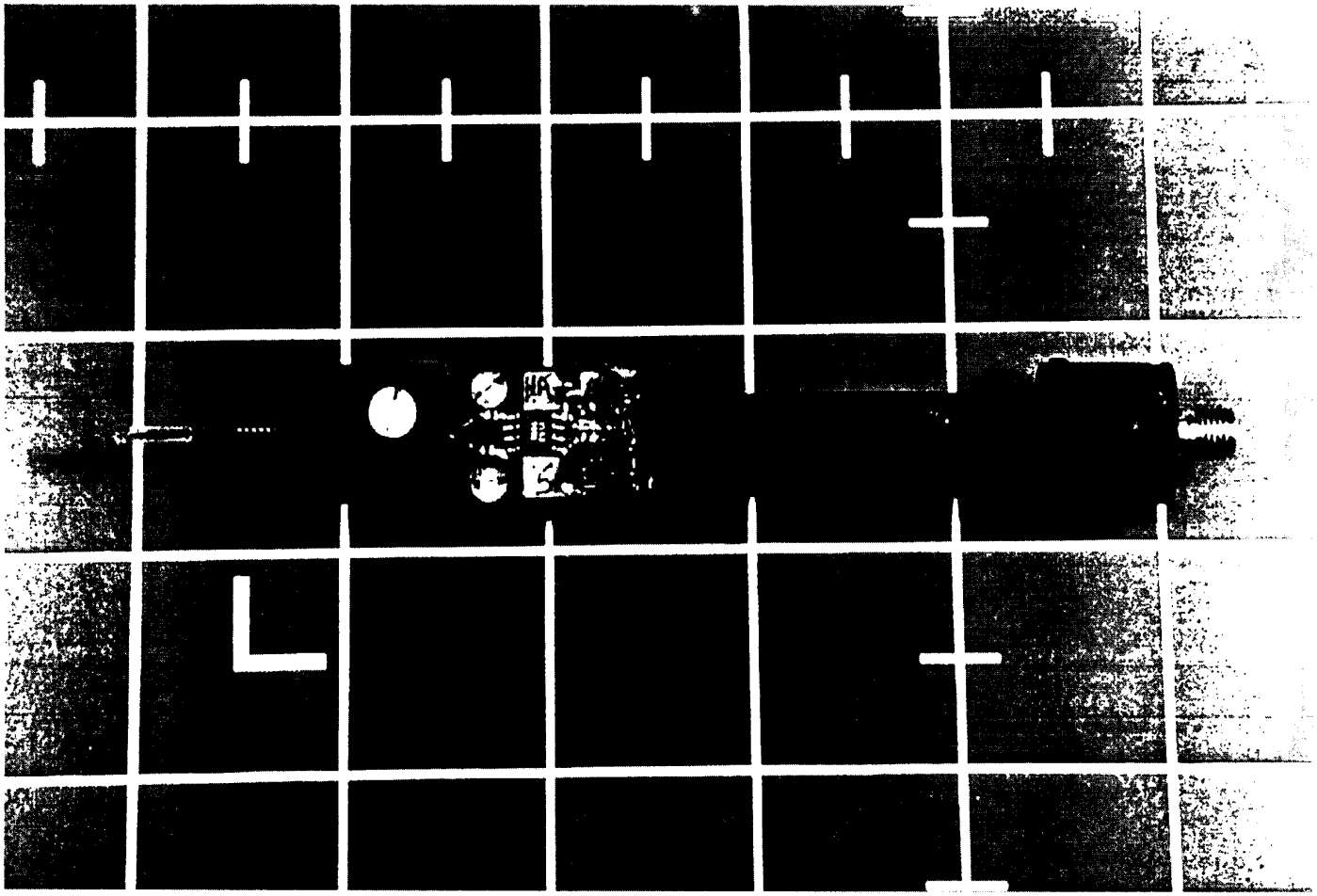


FIG. 22

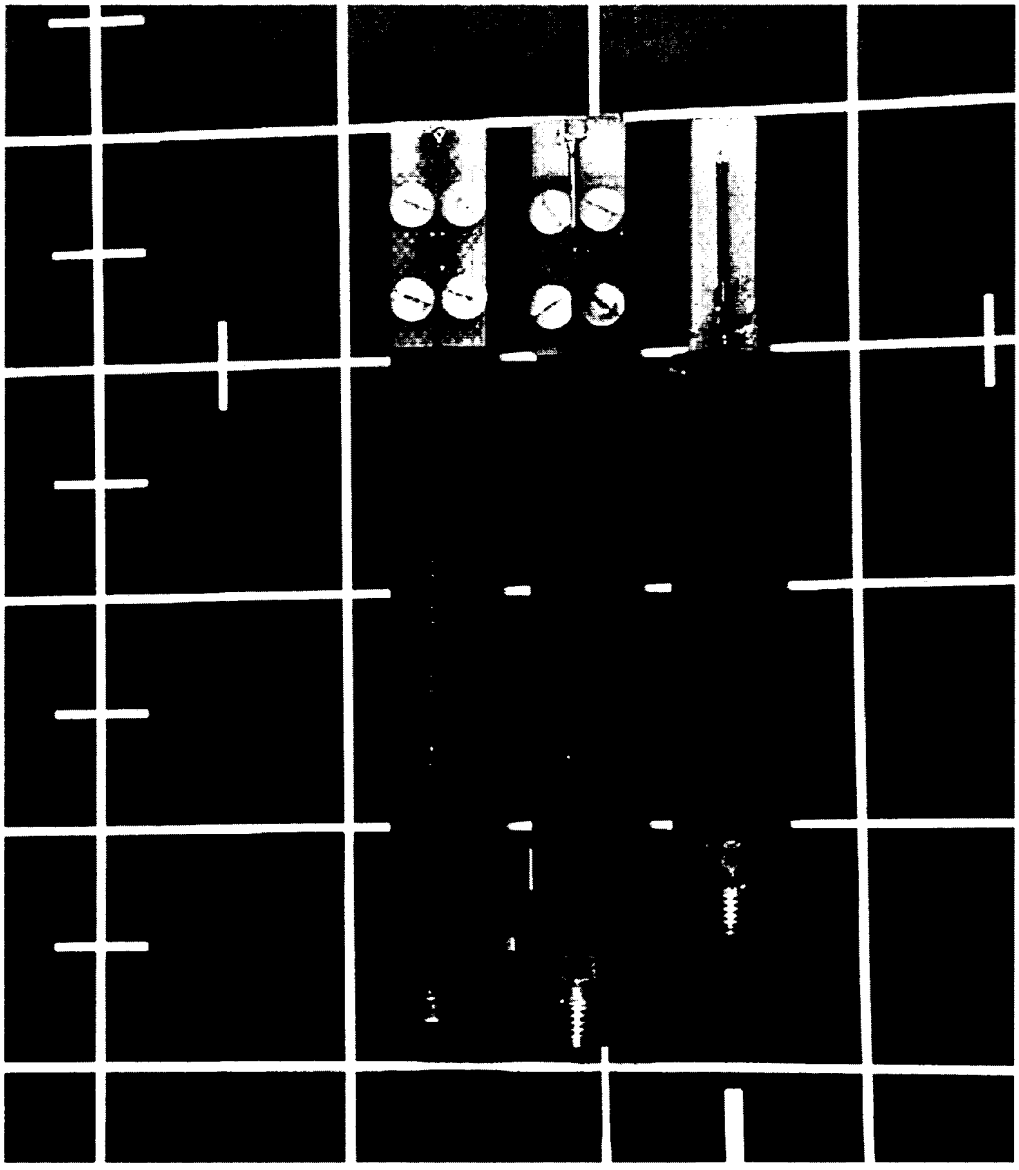


FIG. 23

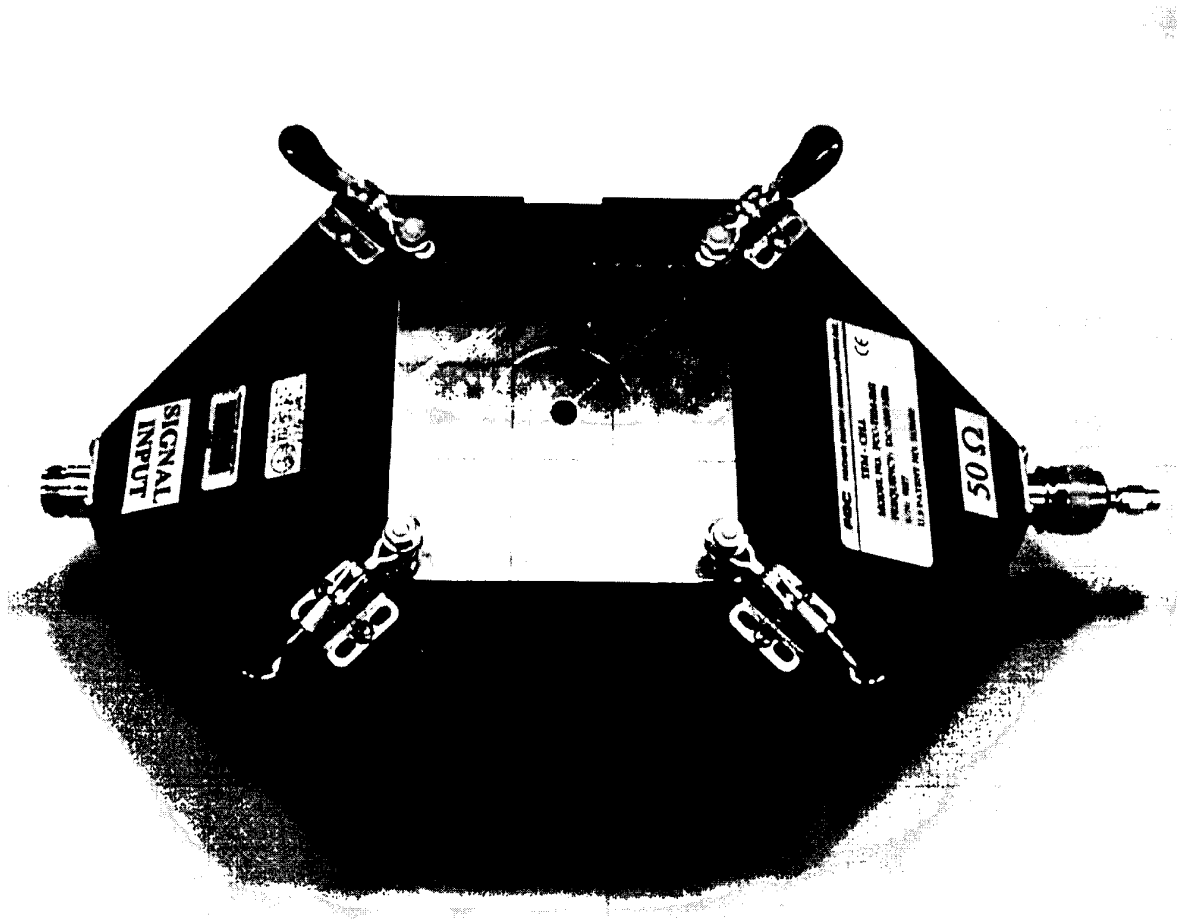


FIG. 24

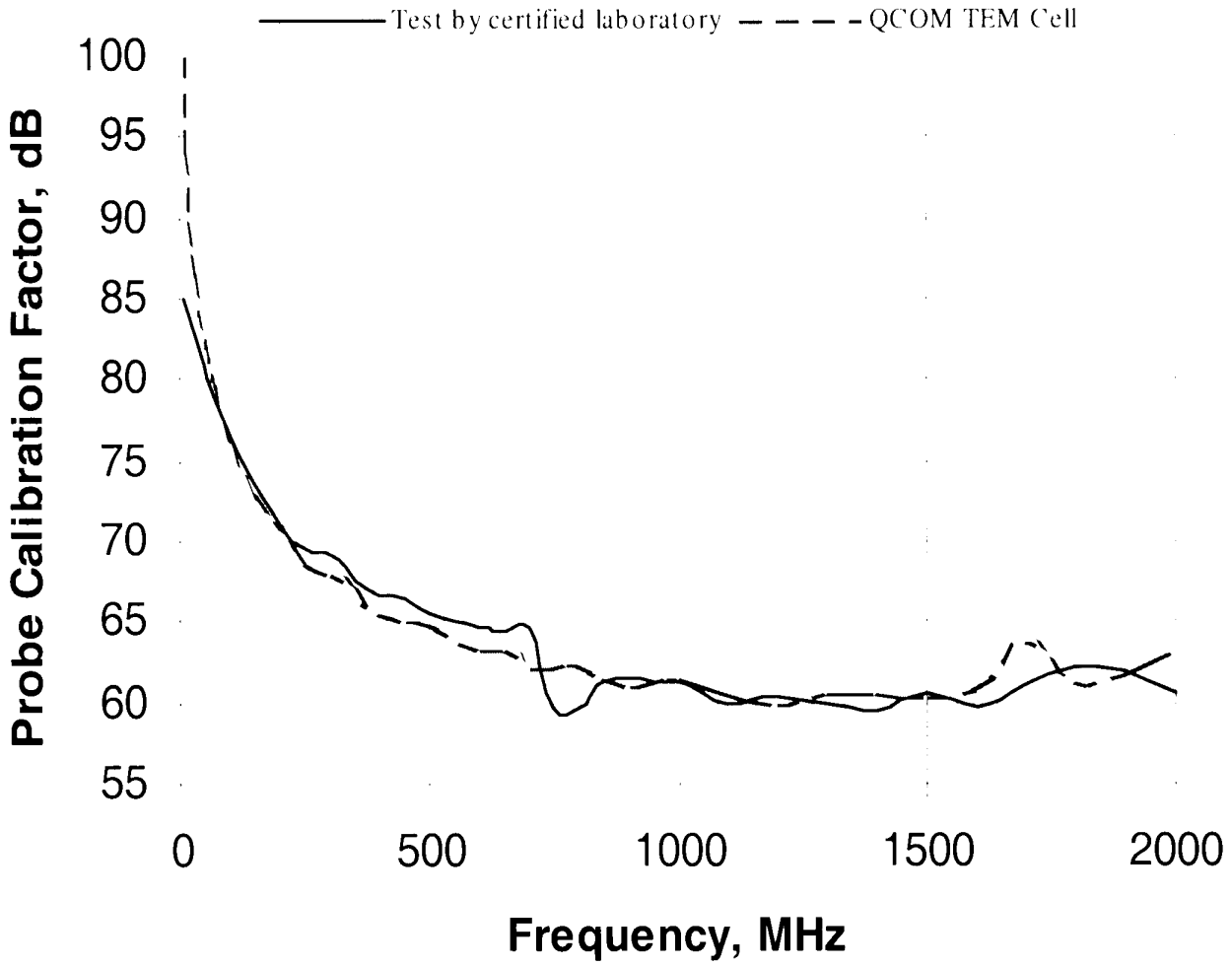

Test by certified laboratory
QCOM TEM Cell
Probe Calibration Factor, dB
100
95
90
85
80
75
70
65
60
55
0
500
1000
1500
2000
Frequency, MHz

FIG. 25

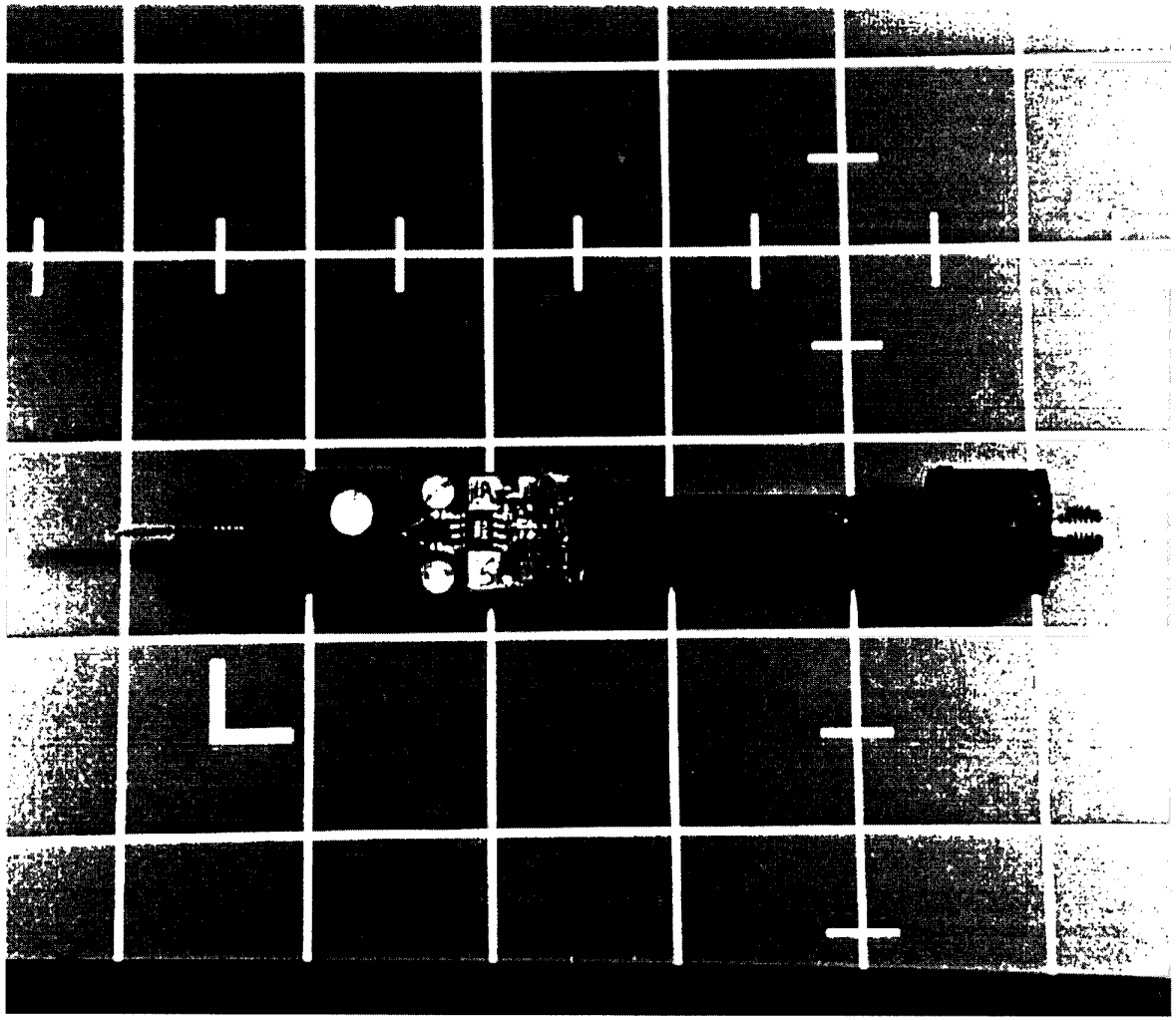


FIG. 26

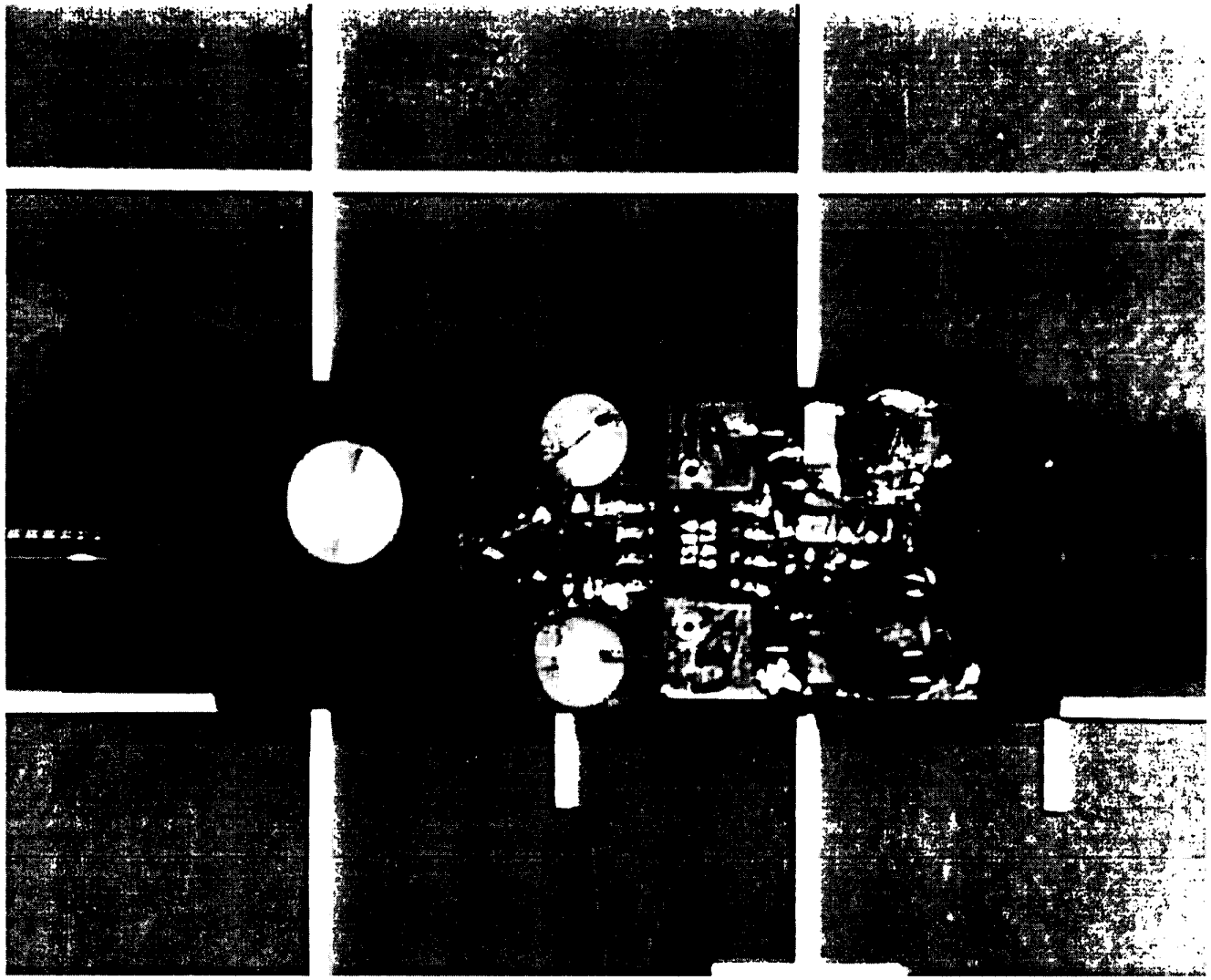


FIG. 27

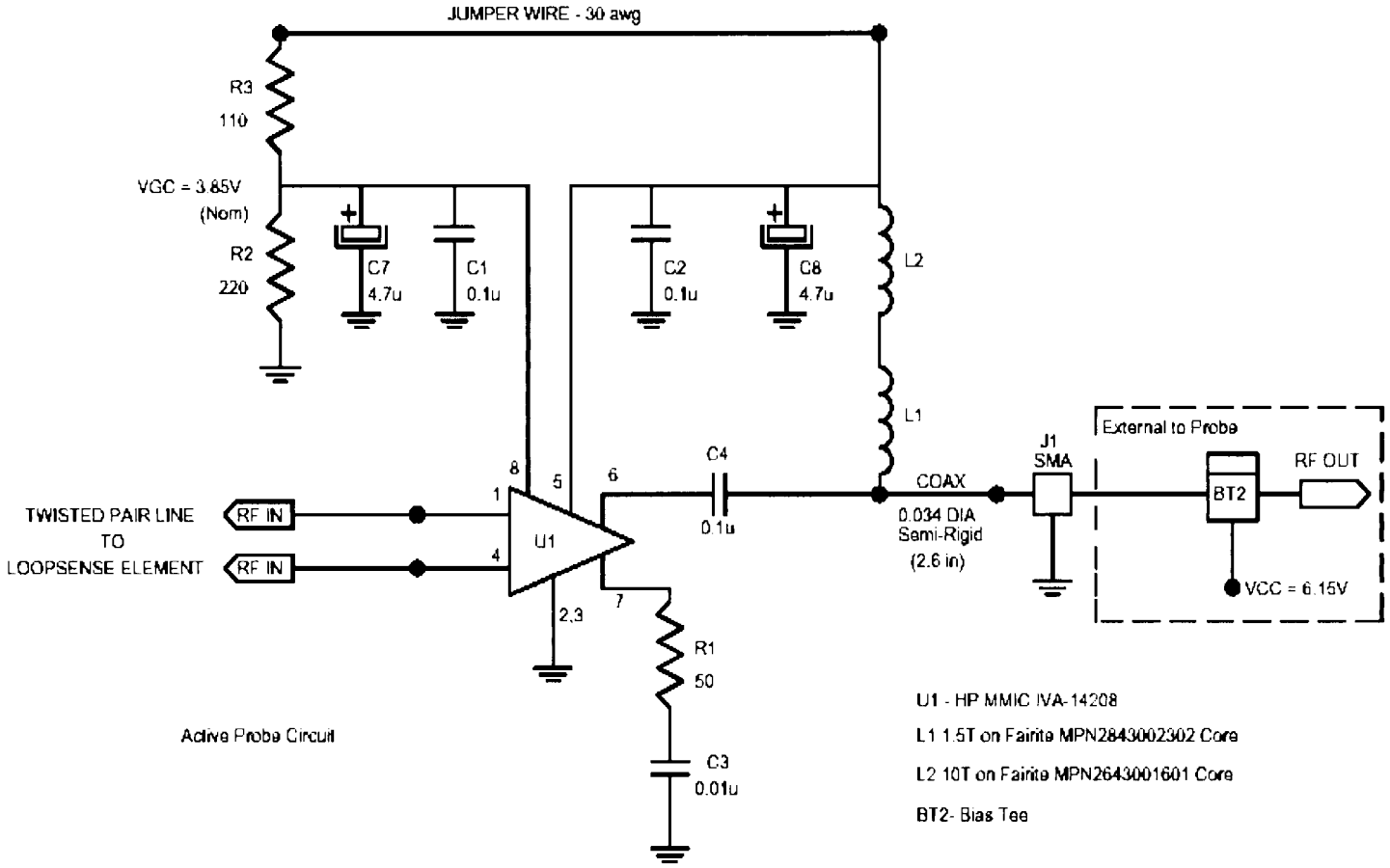

JUMPER WIRE - 30 awg
R3
110
VGC = 3.85V
(Nom)
R2
220
C7
4.7u
C1
0.1u
C2
0.1u
C8
4.7u
L2
L1
J1
SMA
External to Probe
RF OUT
BT2
VCC = 6.15V
C4
0.1u
COAX
0.034 DIA
Semi-Rigid
(2.6 in)
TWISTED PAIR LINE
TO
LOOPSENSE ELEMENT
RF IN
RF IN
U1
1
4
8
5
6
2,3
7
R1
50
C3
0.01u
Active Probe Circuit
U1 - HP MMIC IVA-14208
L1 1.5T on Fairite MPN2843002302 Core
L2 10T on Fairite MPN2643001601 Core
BT2- Bias Tee

FIG. 28

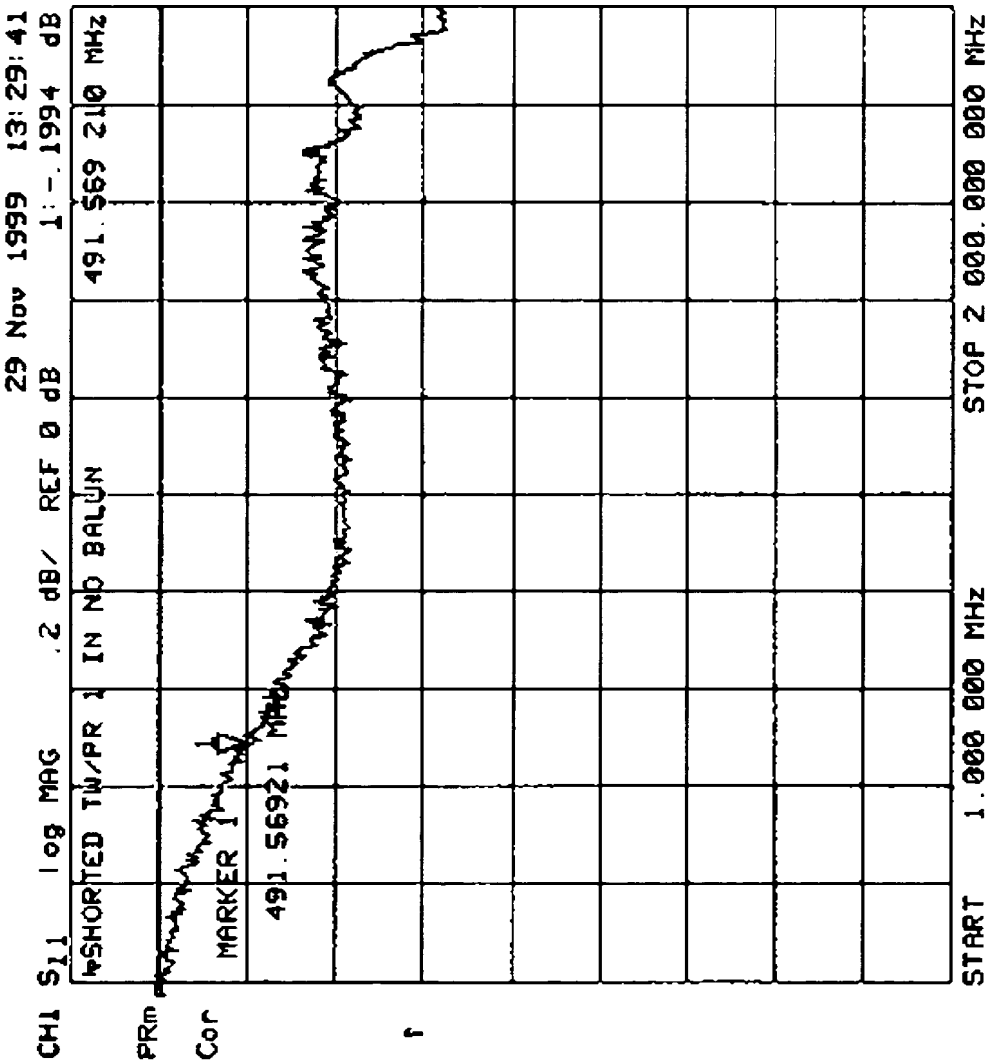
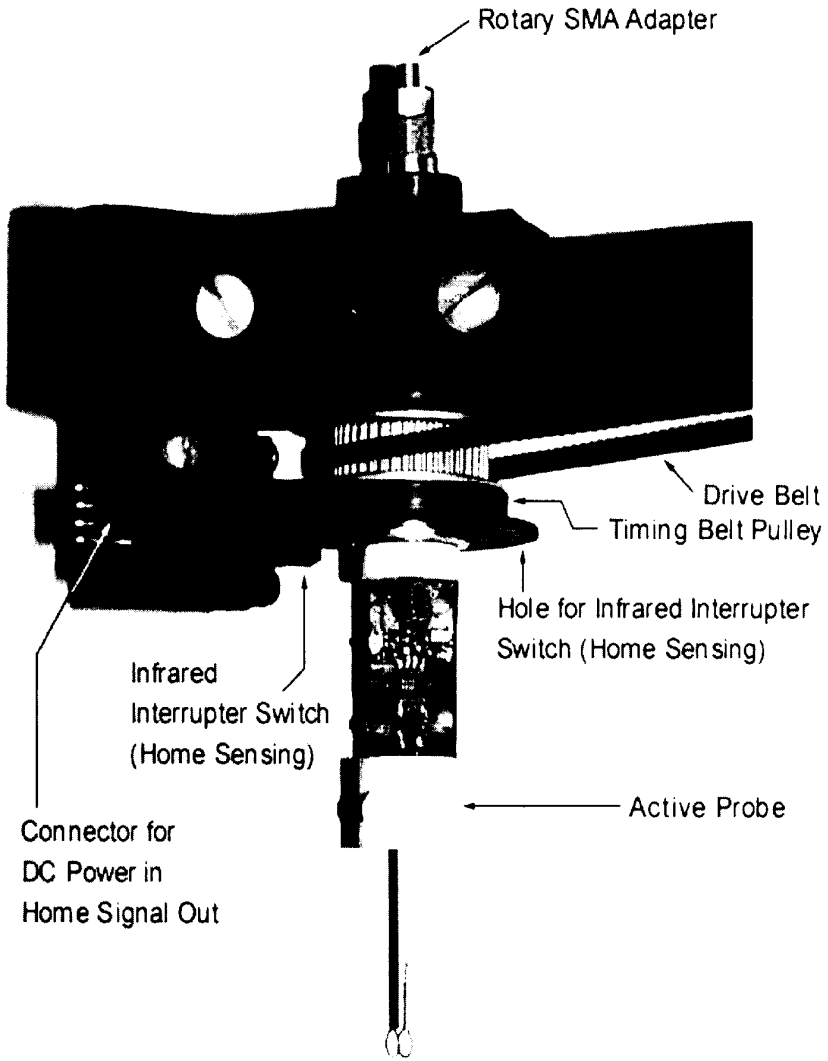

CH1 S11 log MAG .2 dB/ REF 0 dB
29 Nov 1999 13:29:41
1: -.1994 dB
SHORTED TW/PR 1 IN ND BALUN
MARKER 1
491.56921 MHz
491.569 210 MHz
START 1.000 000 MHz
STOP 2 000.000 000 MHz
PRm
Cor
f

FIG. 29

FIG. 30


Rotary SMA Adapter
Drive Belt
Timing Belt Pulley
Hole for Infrared Interrupter Switch (Home Sensing)
Infrared Interrupter Switch (Home Sensing)
Active Probe
Connector for DC Power in Home Signal Out

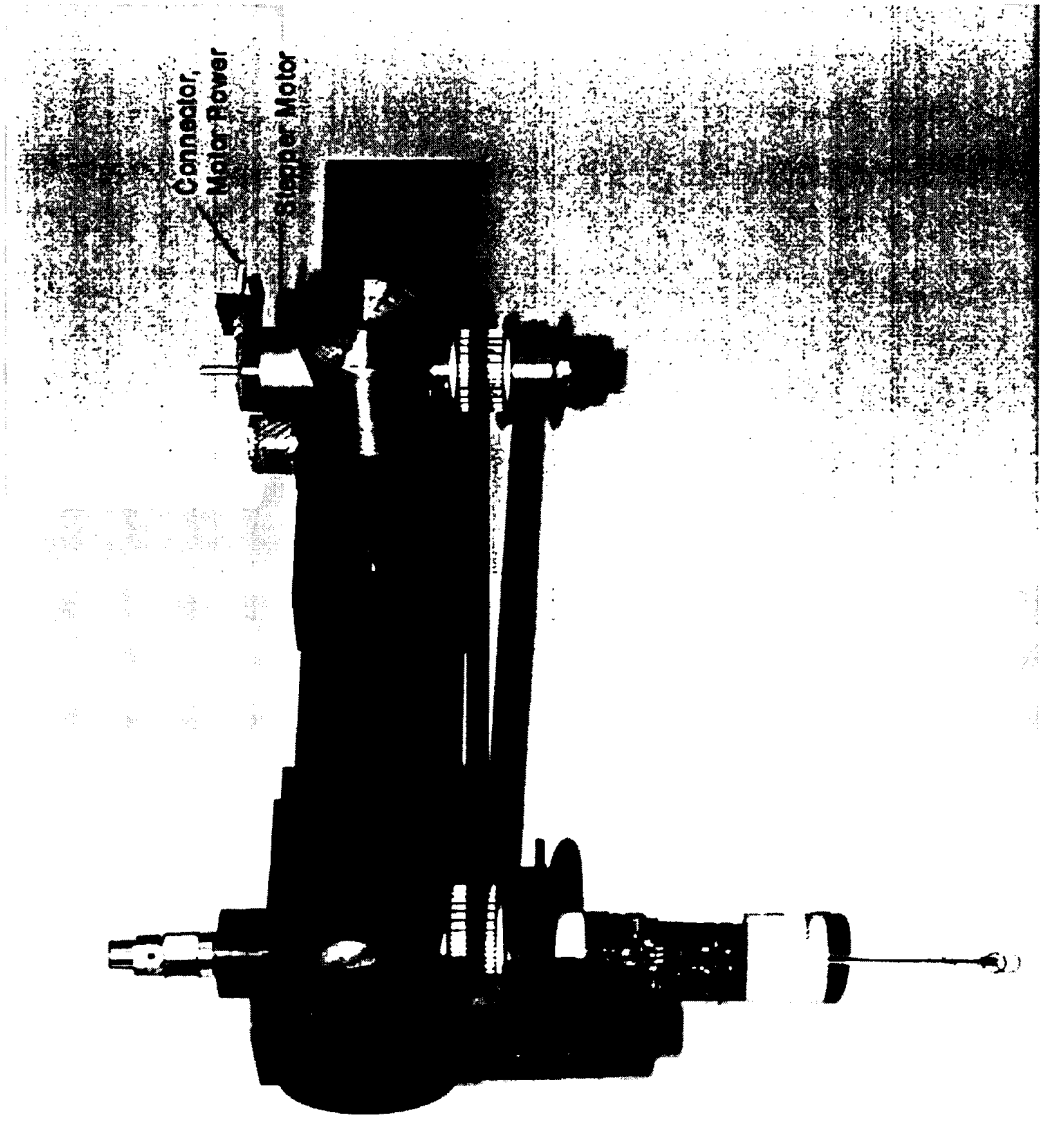


FIG. 31

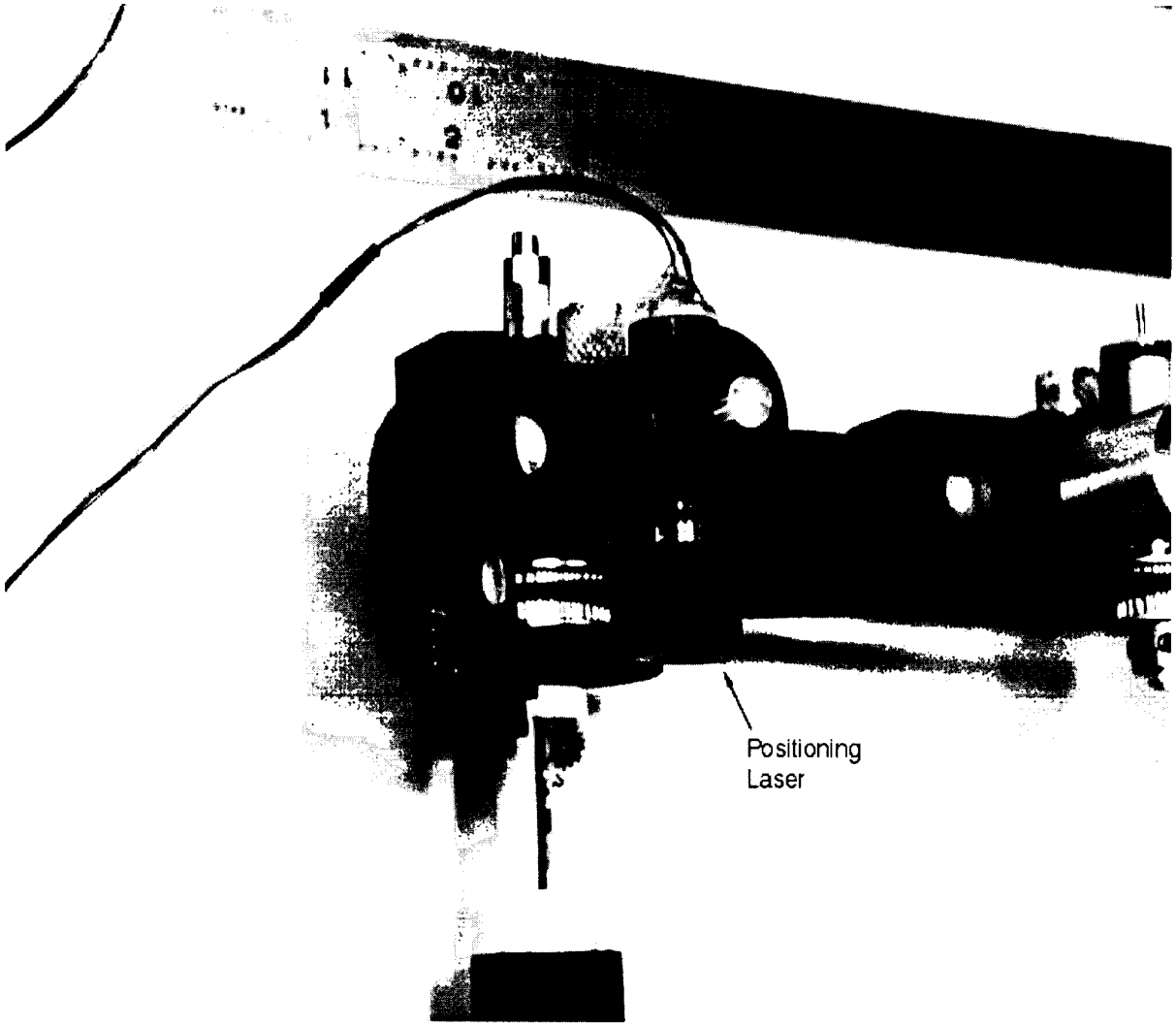


FIG. 32

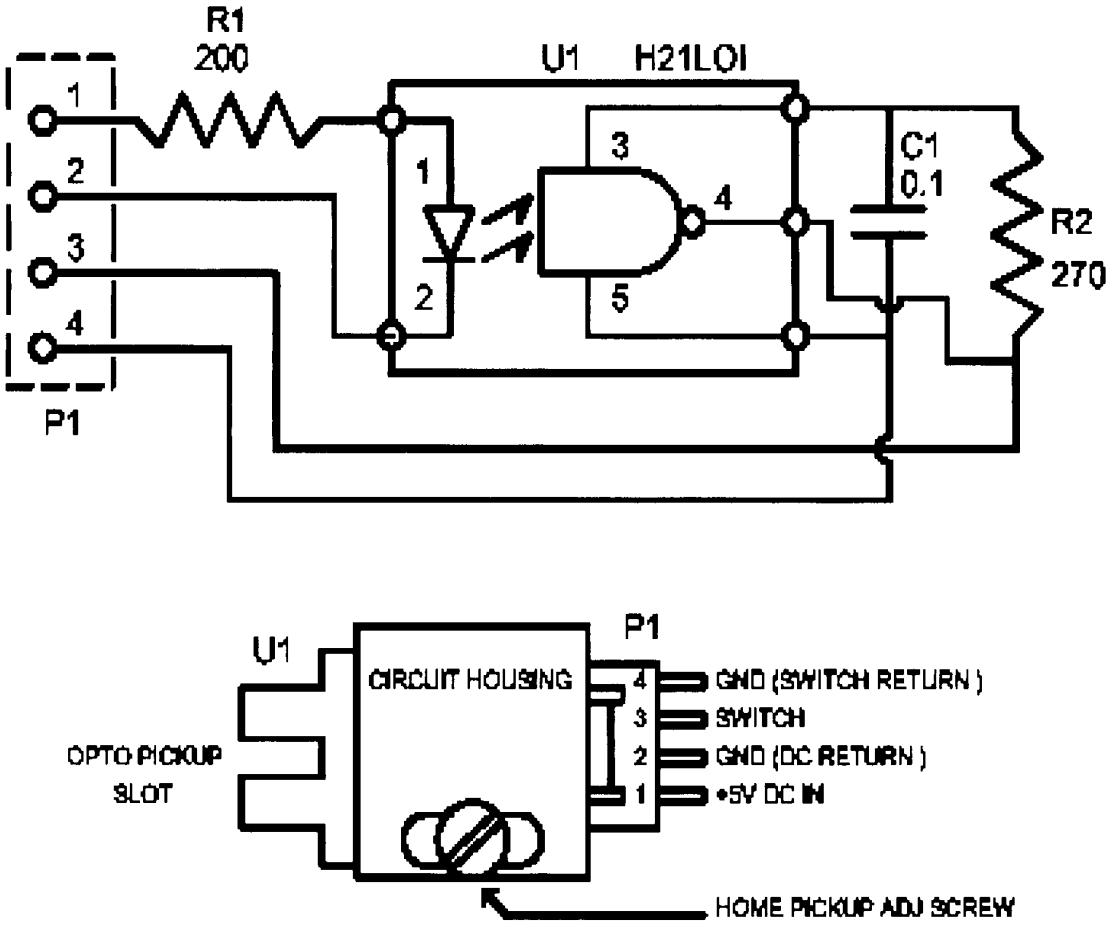

R1
200
U1 H21LOI
1
2
3
4
P1
1
2
3
4
5
C1
0.1
R2
270
U1
P1
CIRCUIT HOUSING
OPTO PICKUP
SLOT
4
3
2
1
GND (SWITCH RETURN)
SWITCH
GND (DC RETURN)
+5V DC IN
HOME PICKUP ADJ SCREW

FIG. 33

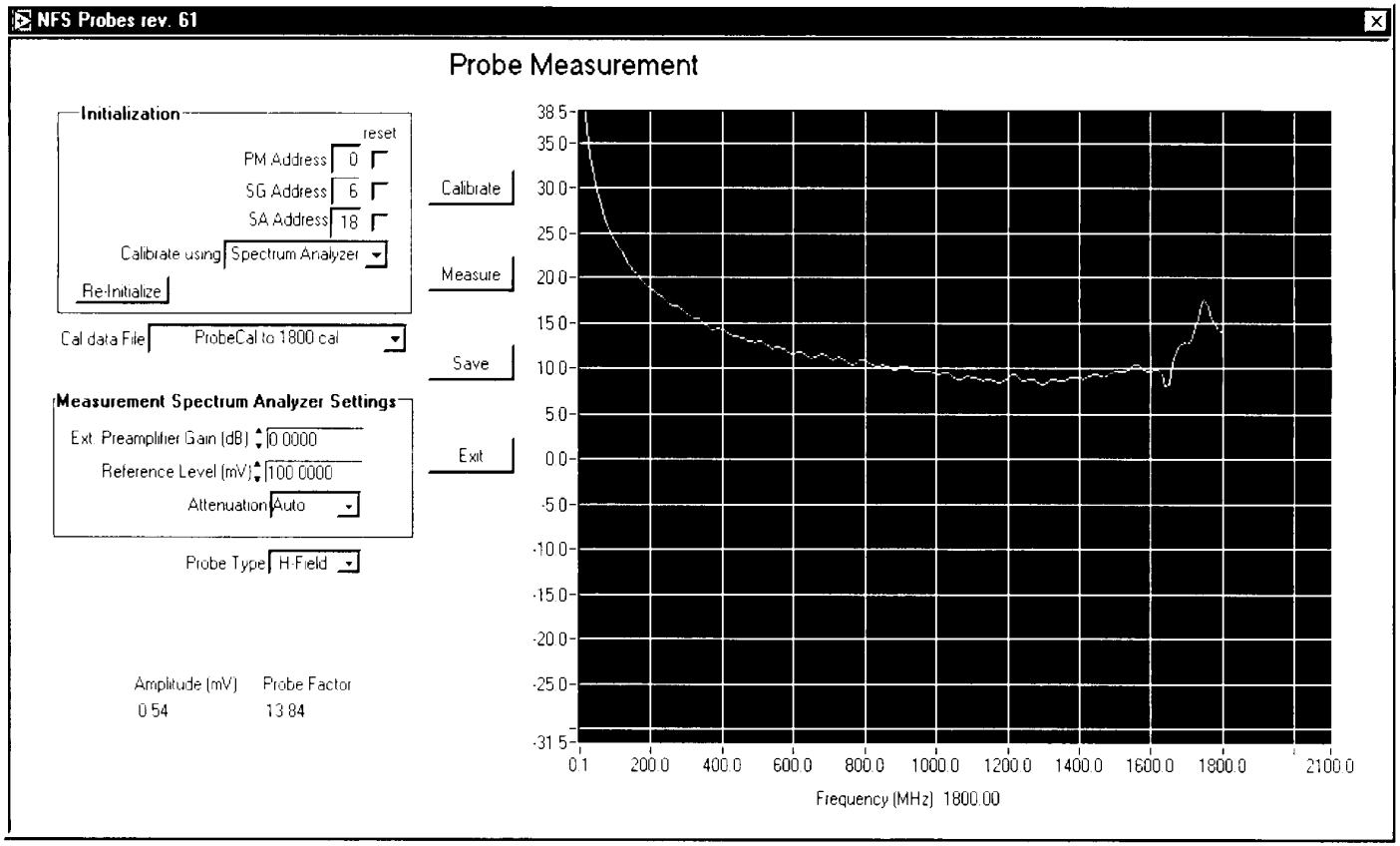

NFS Probes rev. 61
Probe Measurement
Initialization
reset
PM Address 0
SG Address 6
SA Address 18
Calibrate using Spectrum Analyzer
Re-Initialize
Cal data File ProbeCal to 1800 cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0 0000
Reference Level (mV) 100 0000
Attenuation Auto
Probe Type H-Field
Amplitude (mV) Probe Factor
0 54 13 84
Calibrate
Measure
Save
Exit
38 5
35 0
30 0
25 0
20 0
15 0
10 0
5 0
0 0
-5 0
-10 0
-15 0
-20 0
-25 0
-31 5
0 1
200 0
400 0
600 0
800 0
1000 0
1200 0
1400 0
1600 0
1800 0
2100 0
Frequency (MHz) 1800 00

FIG. 34

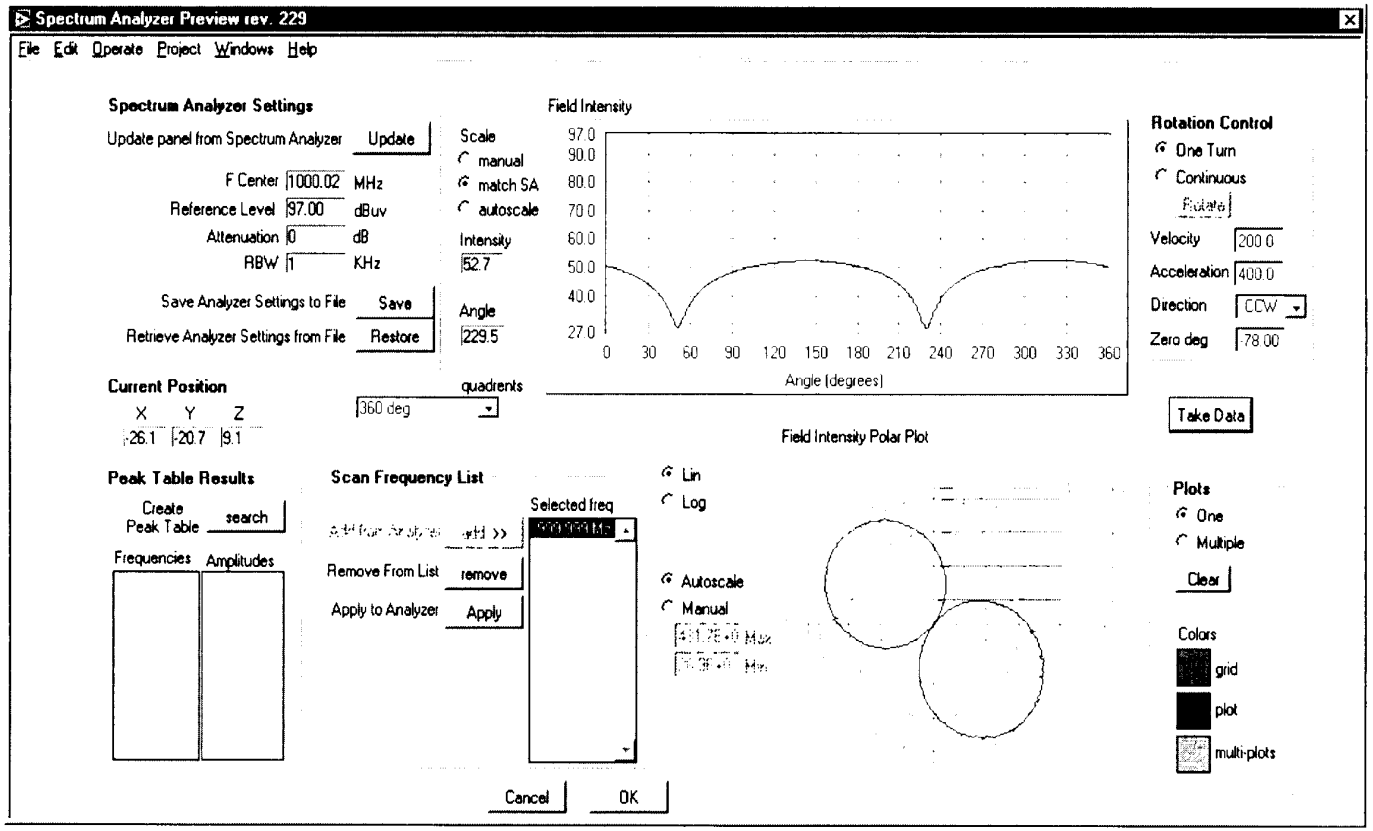

Spectrum Analyzer Preview rev. 229
File Edit Operate Project Windows Help
Spectrum Analyzer Settings
Update panel from Spectrum Analyzer
Update
F Center 1000.02 MHz
Reference Level 97.00 dBuv
Attenuation 0 dB
RBW 1 KHz
Save Analyzer Settings to File
Save
Retrieve Analyzer Settings from File
Restore
Scale
manual
match SA
autoscale
Intensity
52.7
Angle
229.5
Field Intensity
97.0
90.0
80.0
70.0
60.0
50.0
40.0
27.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Angle [degrees]
Rotation Control
One Turn
Continuous
Rotate
Velocity 200.0
Acceleration 400.0
Direction CCW
Zero deg 78.00
Current Position
X Y Z
26.1 -20.7 9.1
quadrents
360 deg
Take Data
Field Intensity Polar Plot
Peak Table Results
Create Peak Table
search
Frequencies
Amplitudes
Scan Frequency List
add >>
Remove From List
remove
Apply to Analyzer
Apply
Selected freq
Lin
Log
Autoscale
Manual
Plots
One
Multiple
Clear
Colors
grid
plot
multi-plots
Cancel
OK

FIG. 35

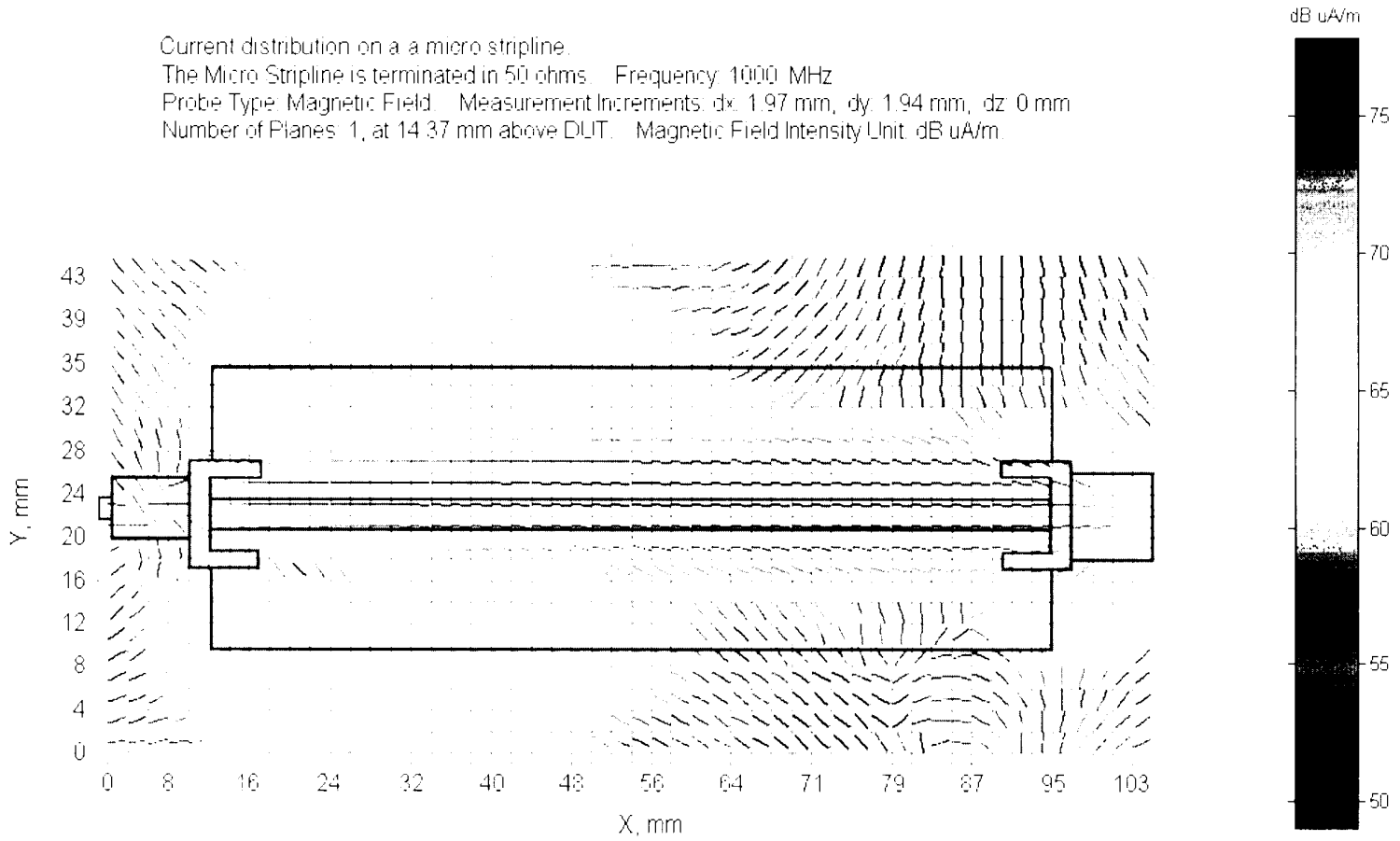

Current distribution on a a micro stripline.
The Micro Stripline is terminated in 50 ohms. Frequency: 1000. MHz
Probe Type: Magnetic Field. Measurement Increments: dx: 1.97 mm, dy: 1.94 mm, dz: 0 mm
Number of Planes: 1, at 14.37 mm above DUT. Magnetic Field Intensity Unit: dB uA/m
dB uA/m
75
70
65
60
55
50
Y, mm
43
39
35
32
28
24
20
16
12
8
4
0
0
8
16
24
32
40
48
56
64
71
79
87
95
103
X, mm

FIG. 36

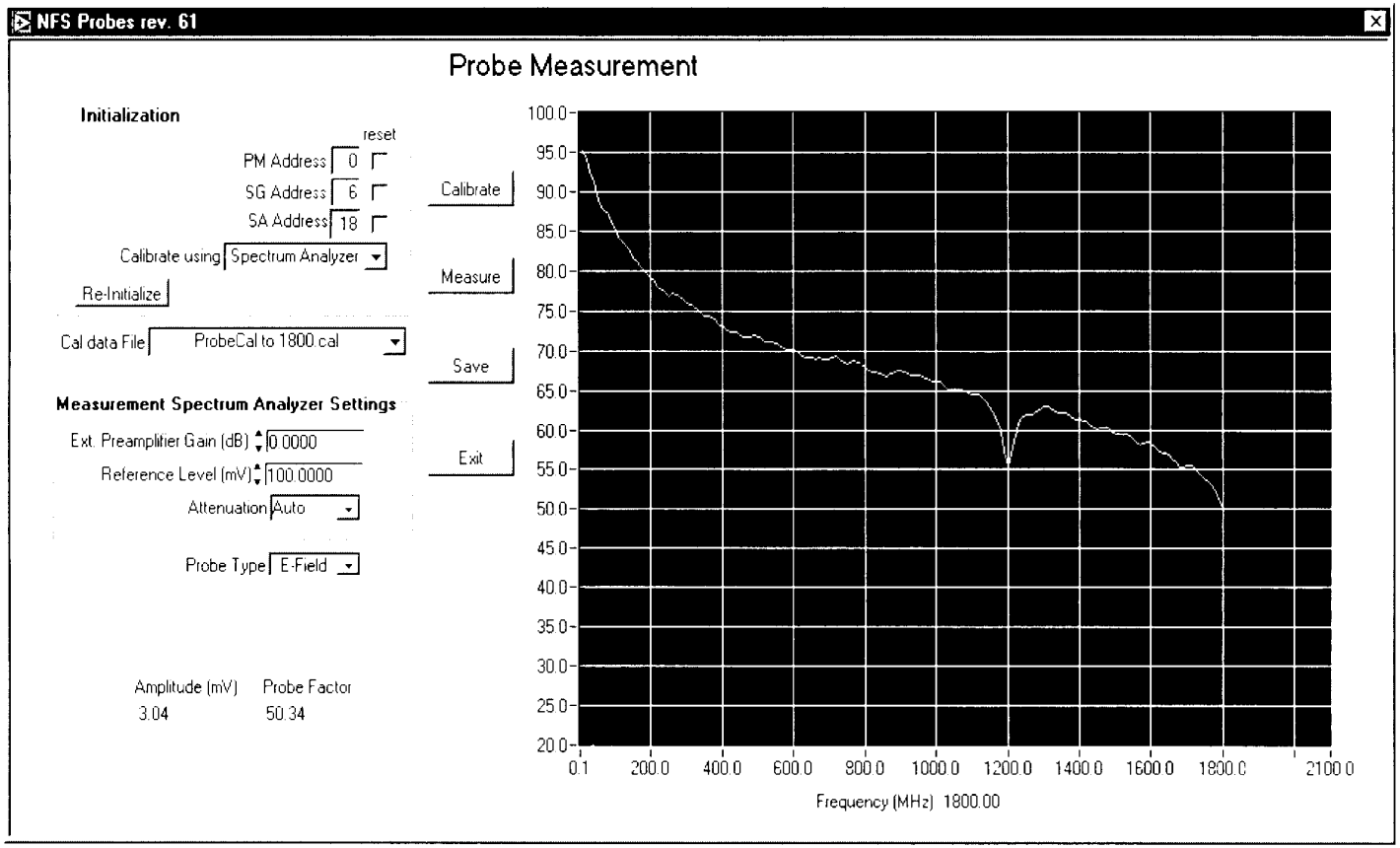

NFS Probes rev. 61
Probe Measurement
Initialization
reset
PM Address 0
SG Address 6
SA Address 18
Calibrate using Spectrum Analyzer
Re-Initialize
Cal data File ProbeCal to 1800.cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type E-Field
Amplitude (mV) 3.04
Probe Factor 50.34
Calibrate
Measure
Save
Exit
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency (MHz) 1800.00

FIG. 37

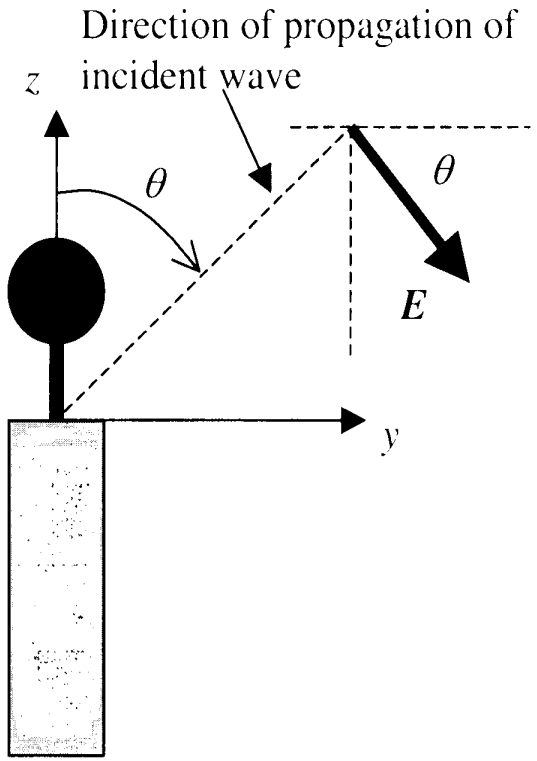


FIG. 38

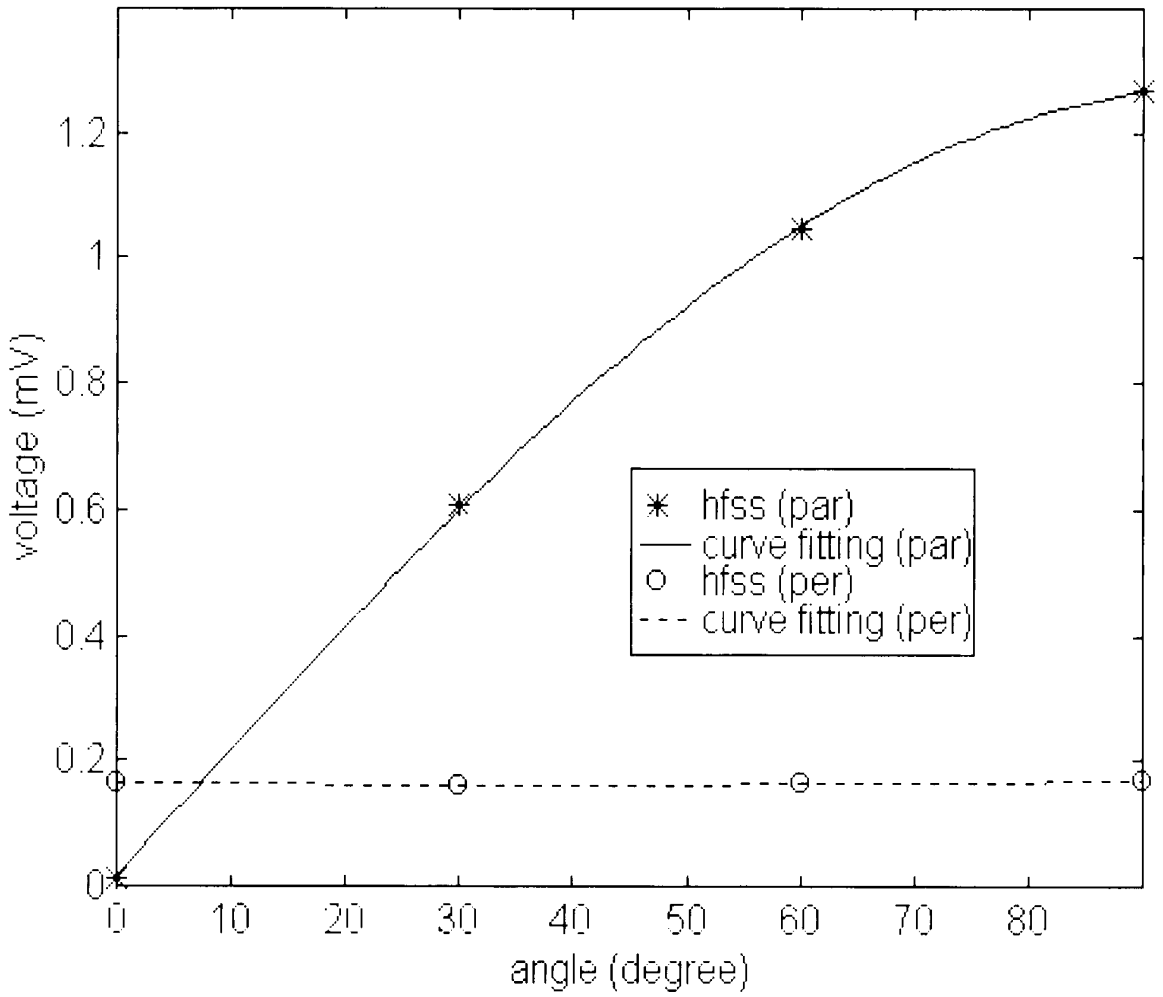

1.2
1
0.8
0.6
0.4
0.2
0
voltage (mV)
0
10
20
30
40
50
60
70
80
angle (degree)
hfss (par)
curve fitting (par)
hfss (per)
curve fitting (per)

FIG. 39

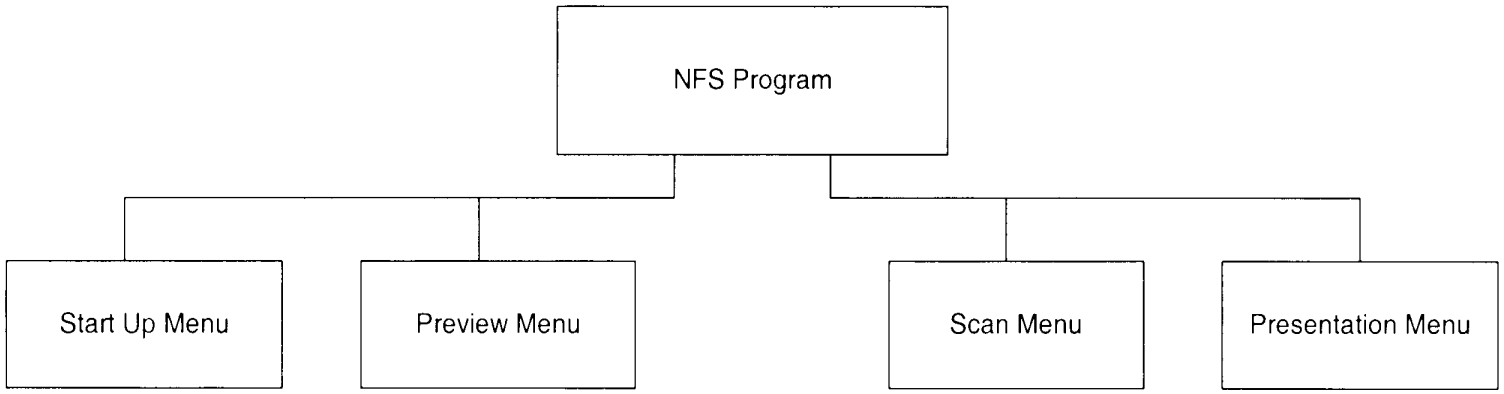

NFS Program
Start Up Menu
Preview Menu
Scan Menu
Presentation Menu

FIG. 40

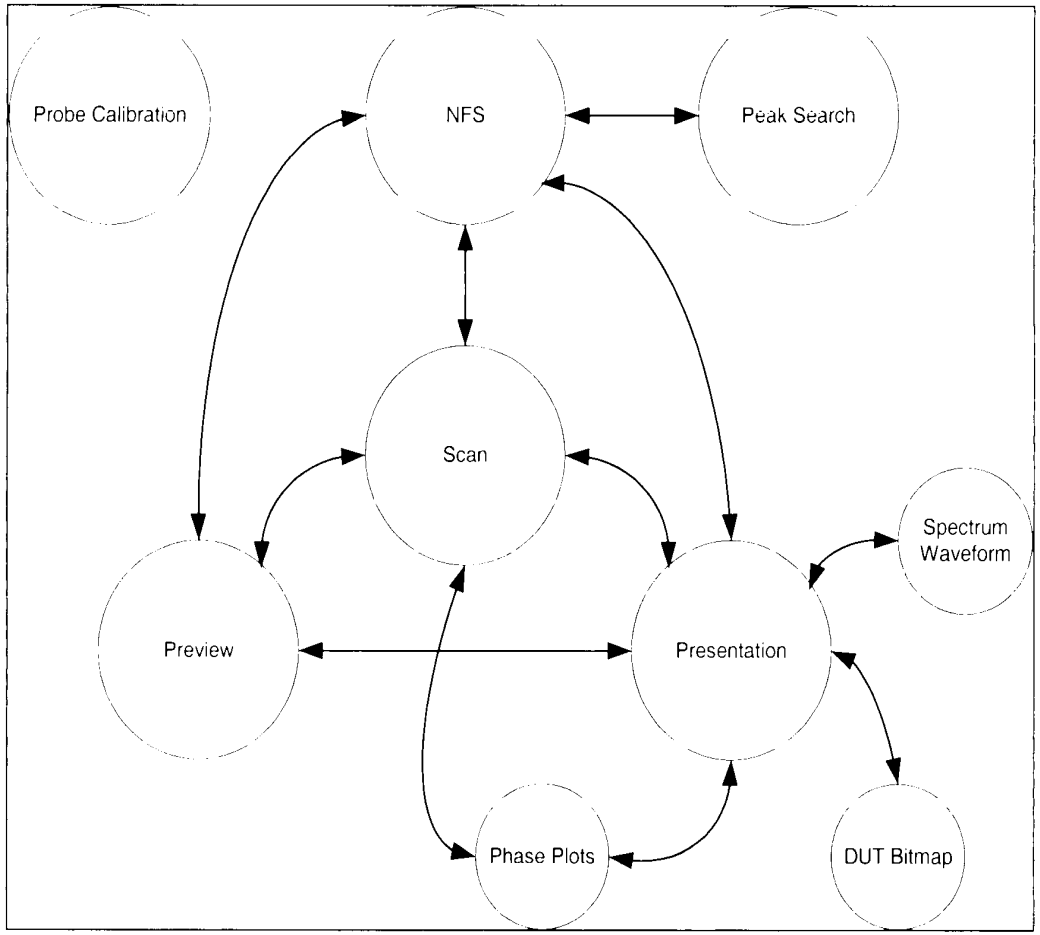

Probe Calibration
NFS
Peak Search
Scan
Spectrum
Waveform
Preview
Presentation
Phase Plots
DUT Bitmap

FIG. 41

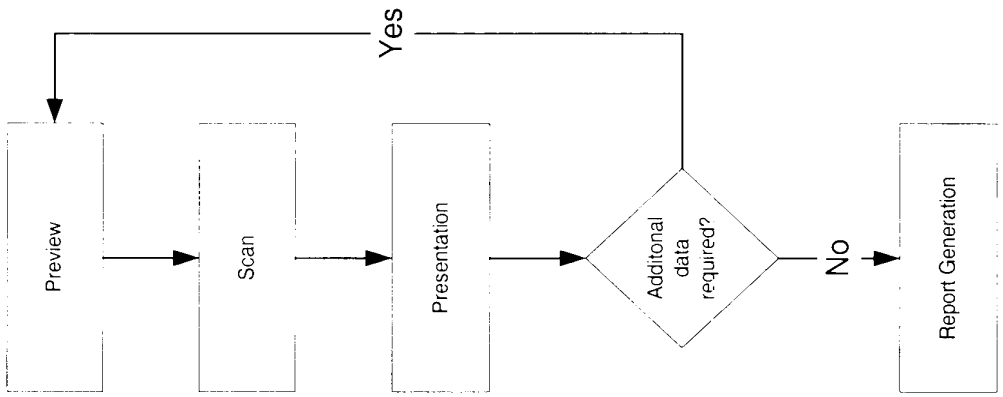

Yes
Preview
Scan
Presentation
Additonal data required?
No
Report Generation

FIG. 42

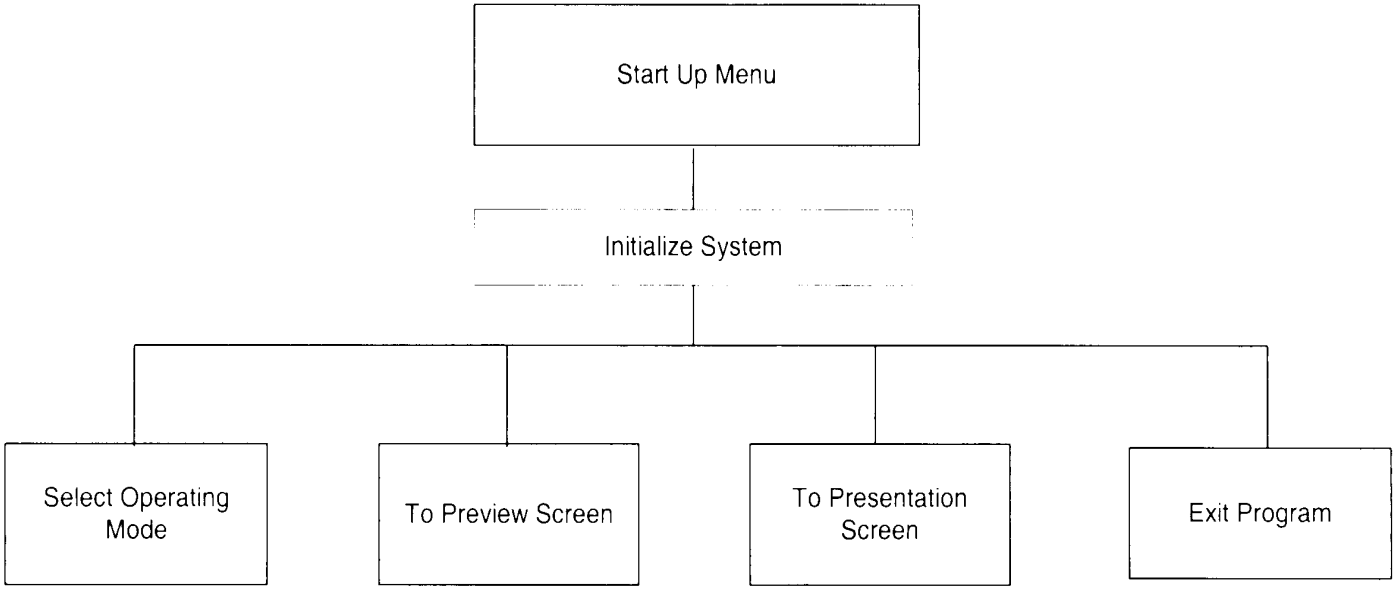

Start Up Menu
Initialize System
Select Operating Mode
To Preview Screen
To Presentation Screen
Exit Program

FIG. 43


Near Field Scanner rev. 154
File Operate Configuration Windows
Preview
Scan
Presentation
Peak Monitoring
Exit
Qualcomm Inc.
Near Field Scanner

FIG. 44

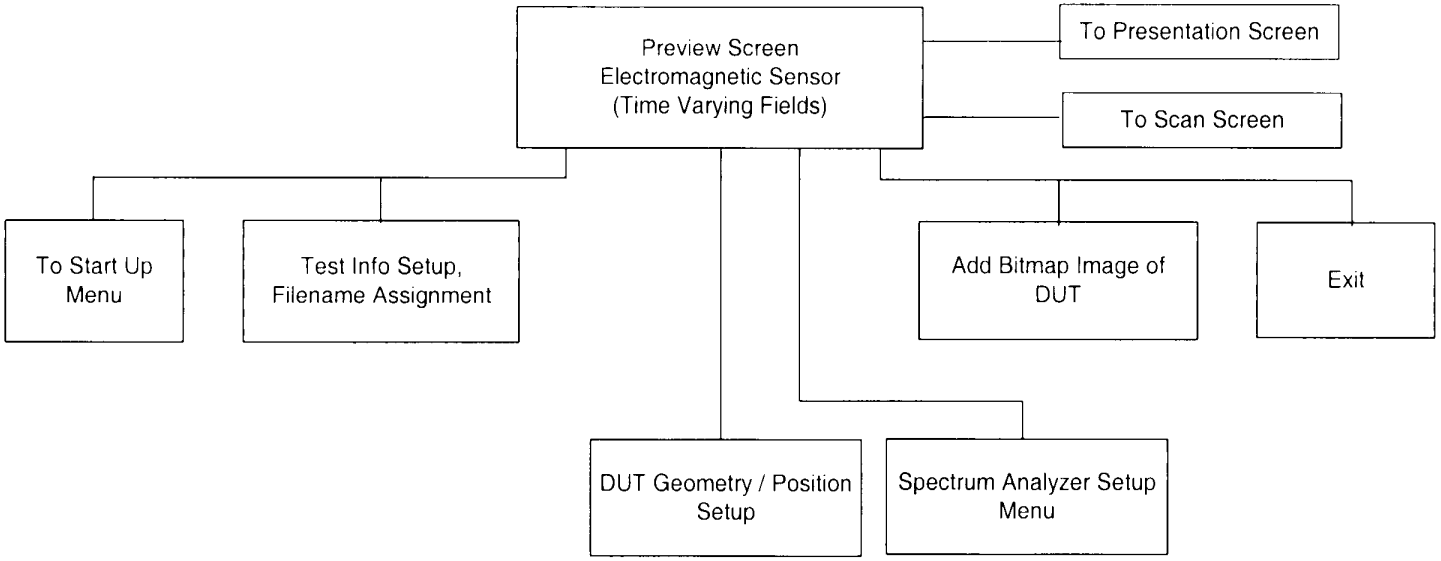

Preview Screen
Electromagnetic Sensor
(Time Varying Fields)
To Presentation Screen
To Scan Screen
To Start Up
Menu
Test Info Setup,
Filename Assignment
Add Bitmap Image of
DUT
Exit
DUT Geometry / Position
Setup
Spectrum Analyzer Setup
Menu

FIG. 45

FIG. 46

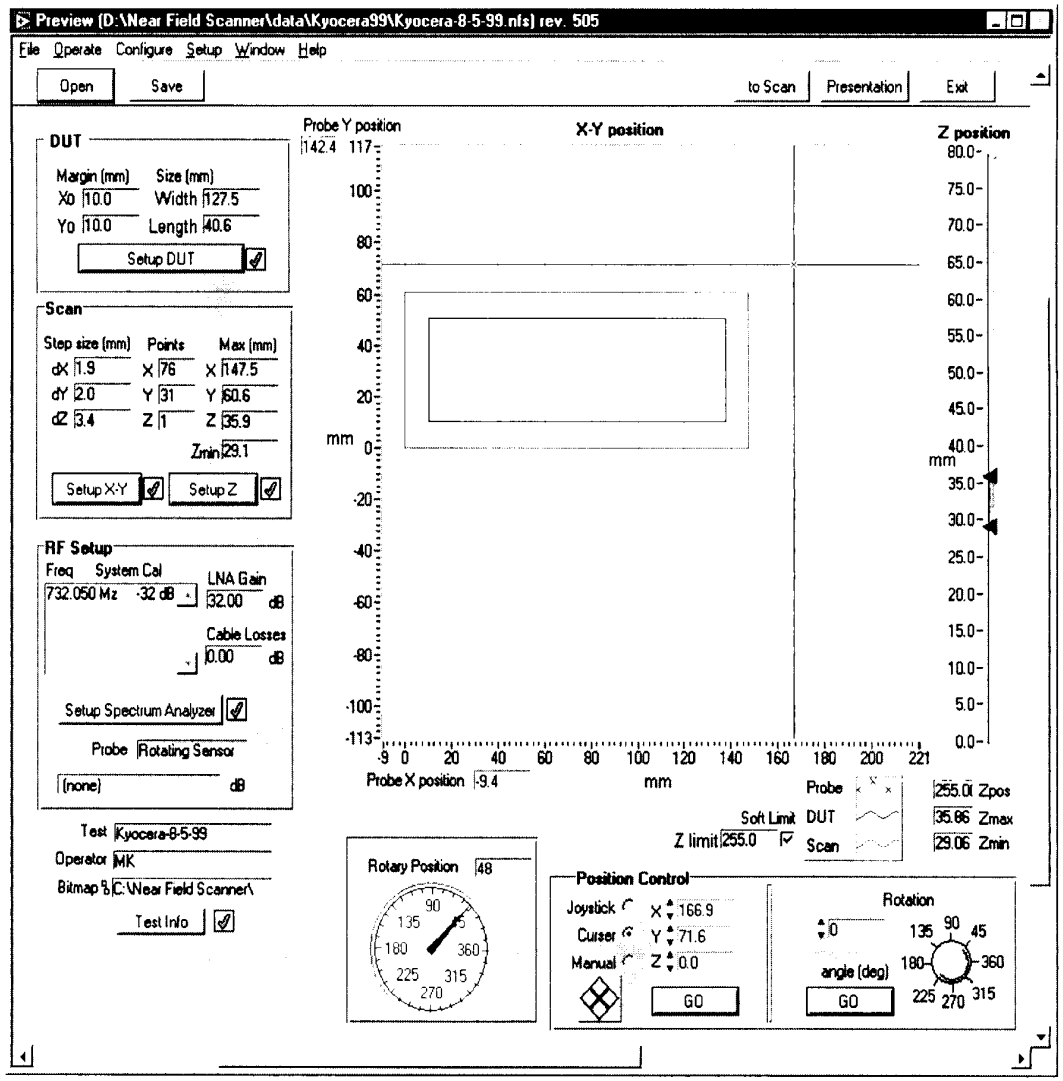
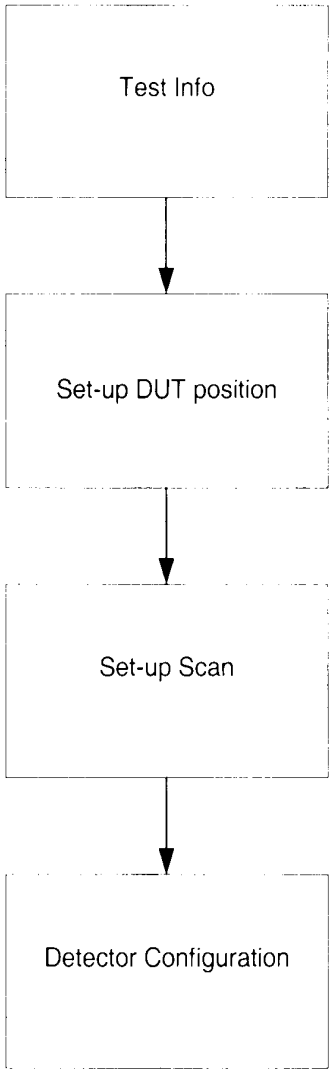

Preview (D:\Near Field Scanner\data\Kyocera99\Kyocera-8-5-99.nfs) rev. 505
File Operate Configure Setup Window Help
Open
Save
to Scan
Presentation
Exit
DUT
Margin (mm)
Size (mm)
Xo 10.0
Width 127.5
Yo 10.0
Length 40.6
Setup DUT
Scan
Step size (mm)
Points
Max (mm)
dX 1.9
X 76
X 147.5
dY 2.0
Y 31
Y 60.6
dZ 3.4
Z 1
Z 35.9
Zmin 29.1
Setup X-Y
Setup Z
RF Setup
Freq
System Cal
LNA Gain
732.050 Mz
-32 dB
32.00 dB
Cable Losses
0.00 dB
Setup Spectrum Analyzer
Probe Rotating Sensor
(none) dB
Test Kyocera-8-5-99
Operator MK
Bitmap C:\Near Field Scanner\
Test Info
Probe Y position
142.4
X-Y position
Z position
mm
Probe X position -9.4
Soft Limit
Z limit 255.0
Probe
DUT
Scan
255.0 Zpos
35.86 Zmax
29.06 Zmin
Rotary Position 48
Position Control
Joystick
Cursor
Manual
X 166.9
Y 71.6
Z 0.0
GO
Rotation
angle (deg)
GO

FIG. 47


Test Info
Set-up DUT position
Set-up Scan
Detector Configuration

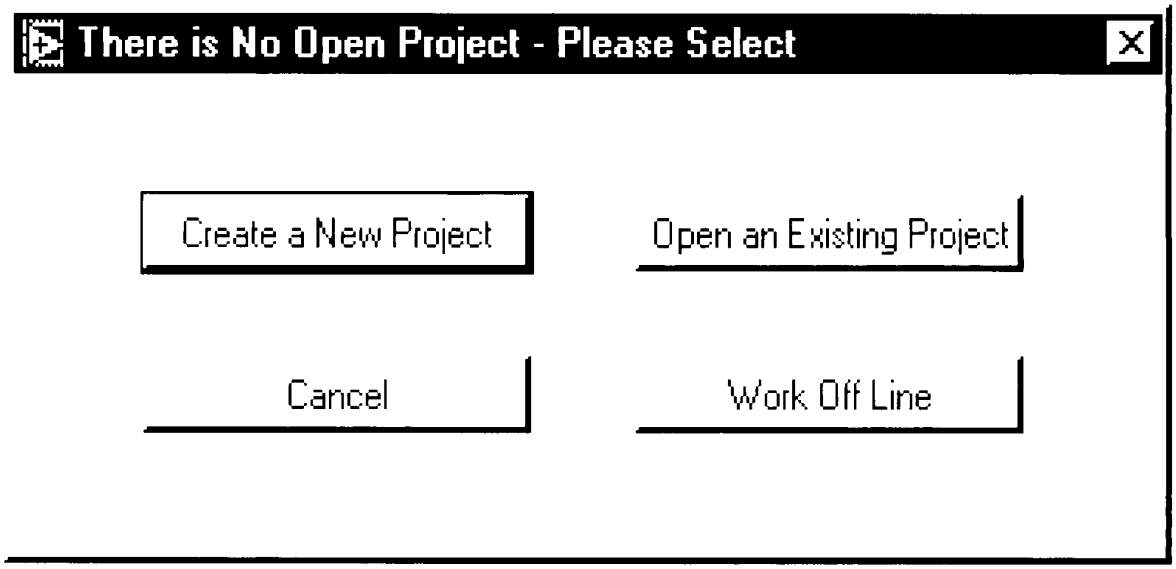

There is No Open Project - Please Select
Create a New Project
Open an Existing Project
Cancel
Work Off Line

FIG. 48

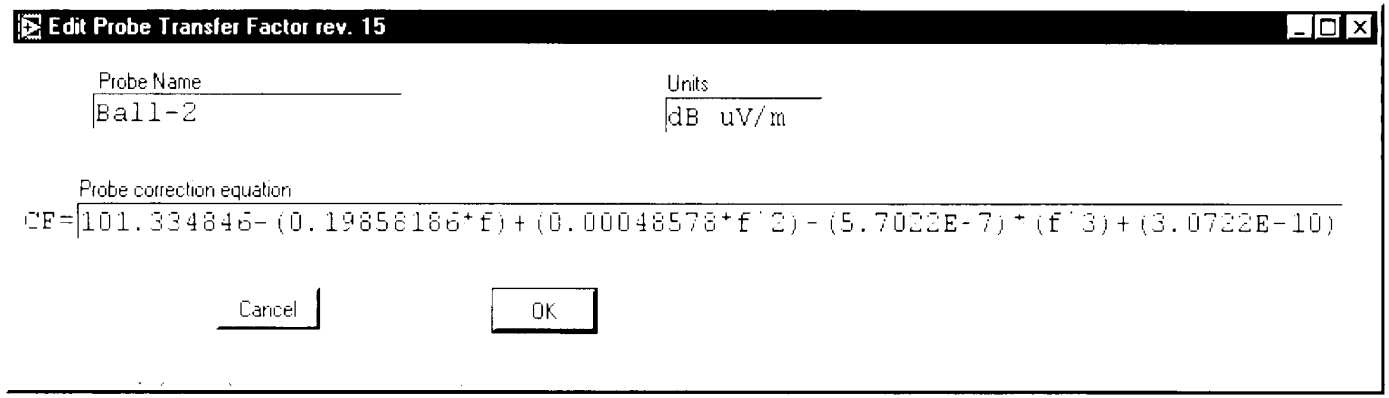

Edit Probe Transfer Factor rev. 15
Probe Name
Ball-2
Units
dB uV/m
Probe correction equation
CF=101.334846-(0.19858186*f)+(0.00048578*f^2)-(5.7022E-7)*(f^3)+(3.0722E-10)
Cancel
OK

FIG. 49

FIG. 50

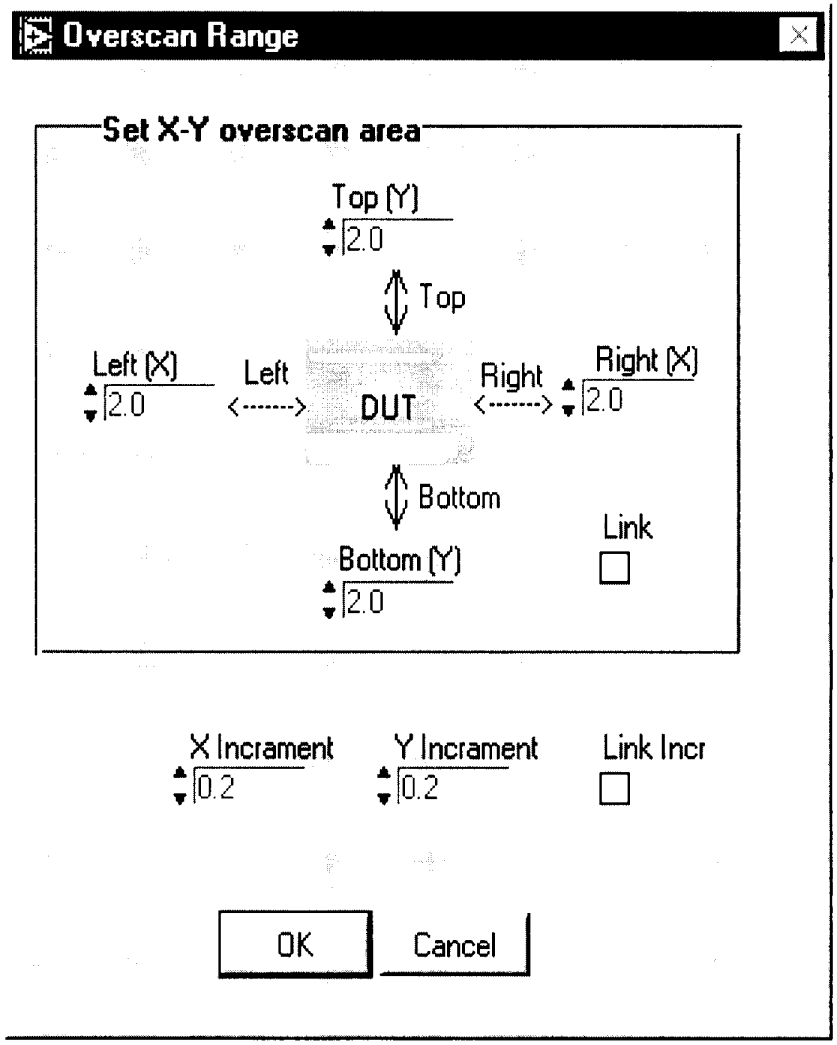

Overscan Range
Set X-Y overscan area
Top (Y)
2.0
Top
Left (X)
2.0
Left
DUT
Right
Right (X)
2.0
Bottom
Link
Bottom (Y)
2.0
X Increment
0.2
Y Increment
0.2
Link Incr
OK
Cancel

FIG. 51

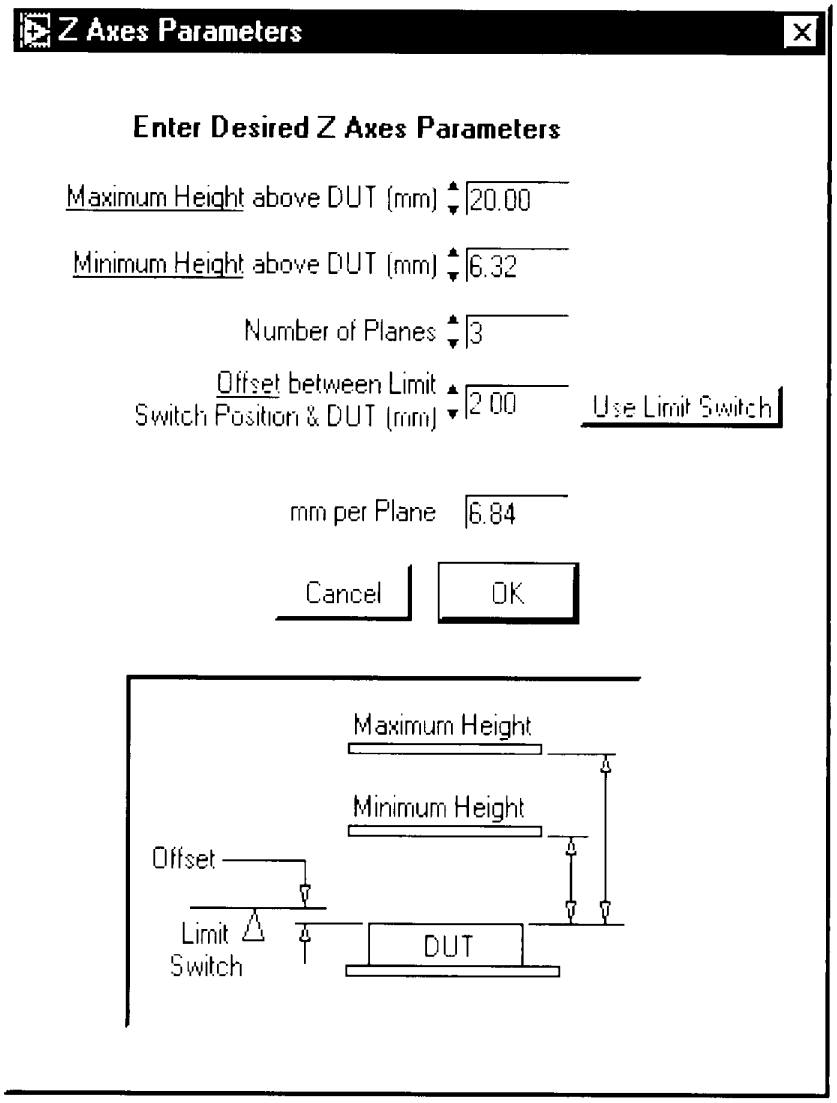
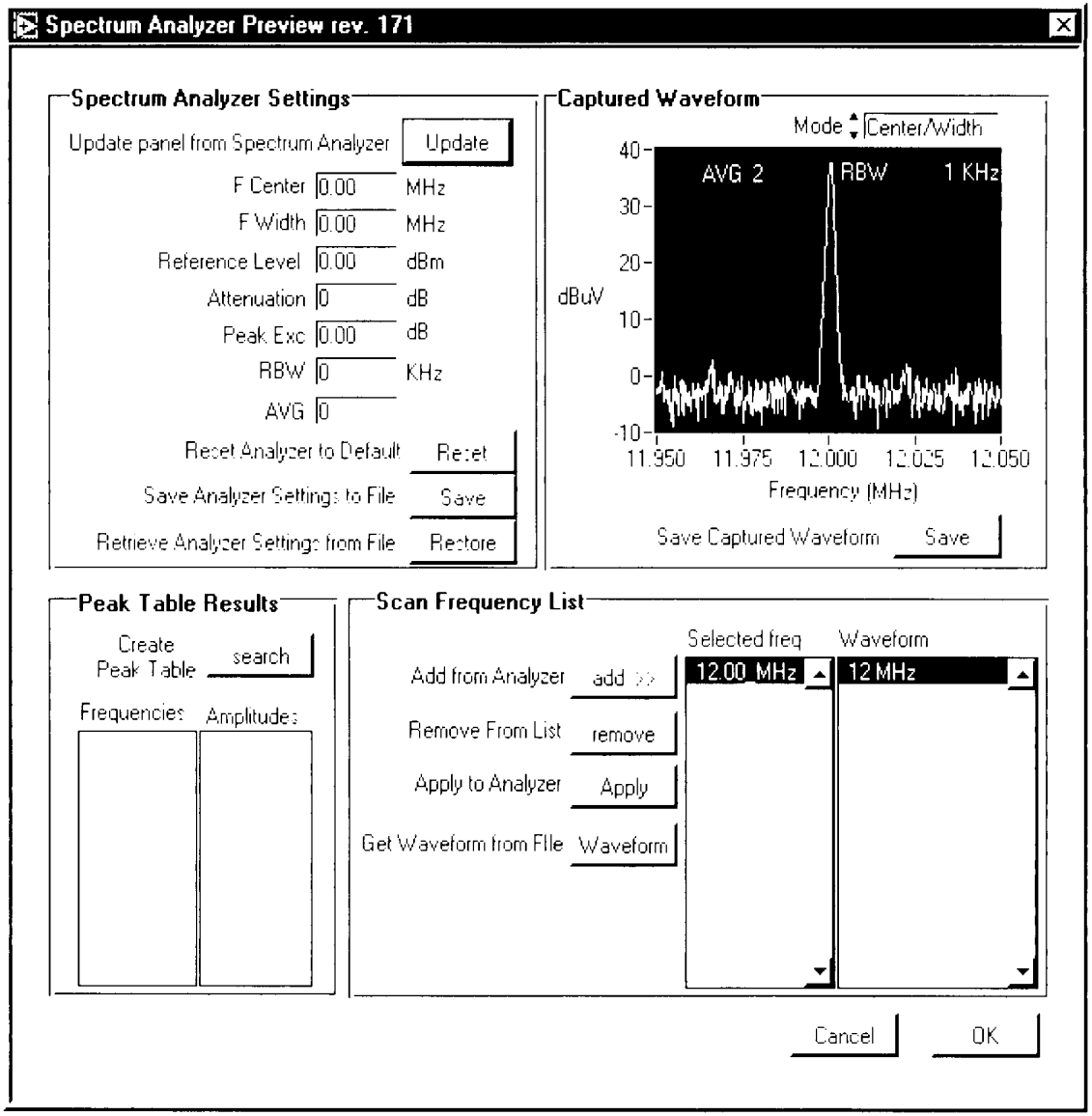

Z Axes Parameters
Enter Desired Z Axes Parameters
Maximum Height above DUT (mm)
20.00
Minimum Height above DUT (mm)
6.32
Number of Planes
3
Offset between Limit Switch Position & DUT (mm)
2.00
Use Limit Switch
mm per Plane
6.84
Cancel
OK
Maximum Height
Minimum Height
Offset
Limit Switch
DUT

FIG. 52


Spectrum Analyzer Preview rev. 171
Spectrum Analyzer Settings
Update panel from Spectrum Analyzer
Update
F Center 0.00 MHz
F Width 0.00 MHz
Reference Level 0.00 dBm
Attenuation 0 dB
Peak Exc 0.00 dB
RBW 0 KHz
AVG 0
Reset Analyzer to Default
Reset
Save Analyzer Settings to File
Save
Retrieve Analyzer Settings from File
Restore
Captured Waveform
Mode Center/Width
AVG 2
RBW 1 KHz
dBuV
40
30
20
10
0
-10
11.950
11.975
12.000
12.025
12.050
Frequency (MHz)
Save Captured Waveform
Save
Peak Table Results
Create Peak Table
search
Frequencies
Amplitudes
Scan Frequency List
Selected freq
Waveform
Add from Analyzer
add >>
12.00 MHz
12 MHz
Remove From List
remove
Apply to Analyzer
Apply
Get Waveform from File
Waveform
Cancel
OK

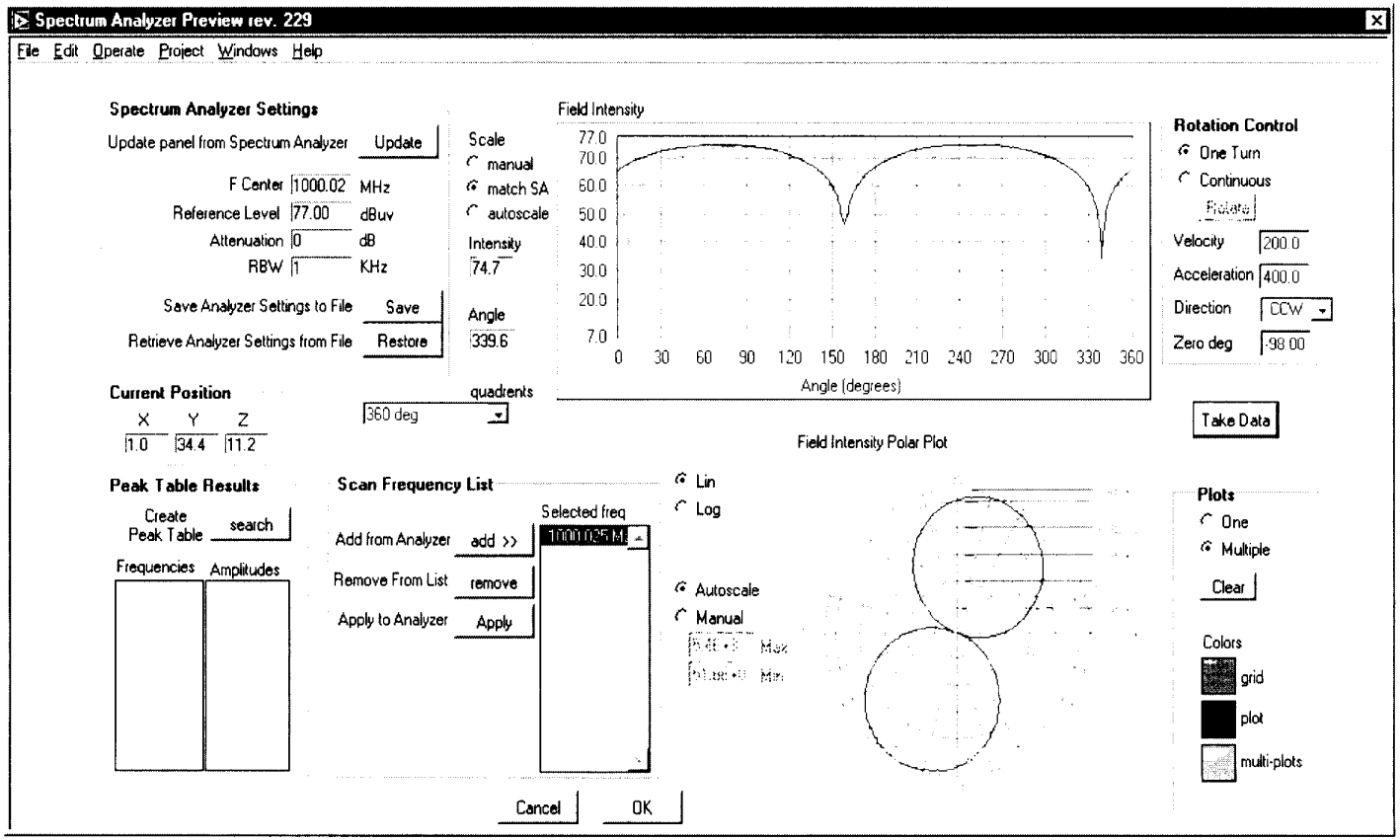

Spectrum Analyzer Preview rev. 229
File Edit Operate Project Windows Help
Spectrum Analyzer Settings
Update panel from Spectrum Analyzer
Update
F Center 1000.02 MHz
Reference Level 77.00 dBuv
Attenuation 0 dB
RBW 1 KHz
Save Analyzer Settings to File
Save
Retrieve Analyzer Settings from File
Restore
Scale
manual
match SA
autoscale
Intensity
74.7
Angle
339.6
quadrents
360 deg
Field Intensity
77.0
70.0
60.0
50.0
40.0
30.0
20.0
7.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Angle (degrees)
Rotation Control
One Turn
Continuous
Rotate
Velocity 200.0
Acceleration 400.0
Direction CCW
Zero deg 98.00
Take Data
Current Position
X Y Z
1.0 34.4 11.2
Field Intensity Polar Plot
Peak Table Results
Create Peak Table
search
Frequencies
Amplitudes
Scan Frequency List
Add from Analyzer
add >>
Remove From List
remove
Apply to Analyzer
Apply
Selected freq
Lin
Log
Autoscale
Manual
Plots
One
Multiple
Clear
Colors
grid
plot
multi-plots
Cancel
OK

FIG. 53

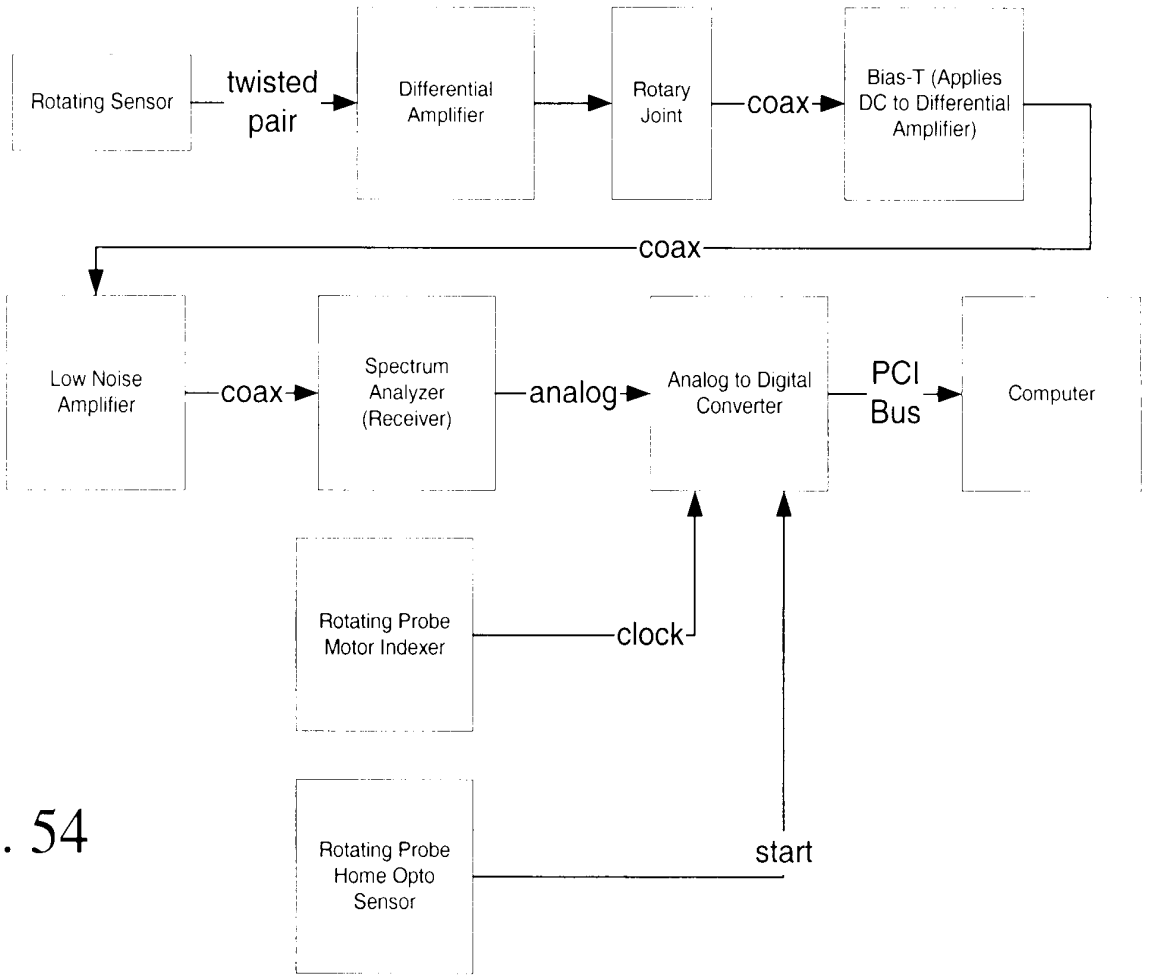

Rotating Sensor
twisted pair
Differential Amplifier
Rotary Joint
coax
Bias-T (Applies DC to Differential Amplifier)
coax
Low Noise Amplifier
coax
Spectrum Analyzer (Receiver)
analog
Analog to Digital Converter
PCI Bus
Computer
Rotating Probe Motor Indexer
clock
Rotating Probe Home Opto Sensor
start

FIG. 54

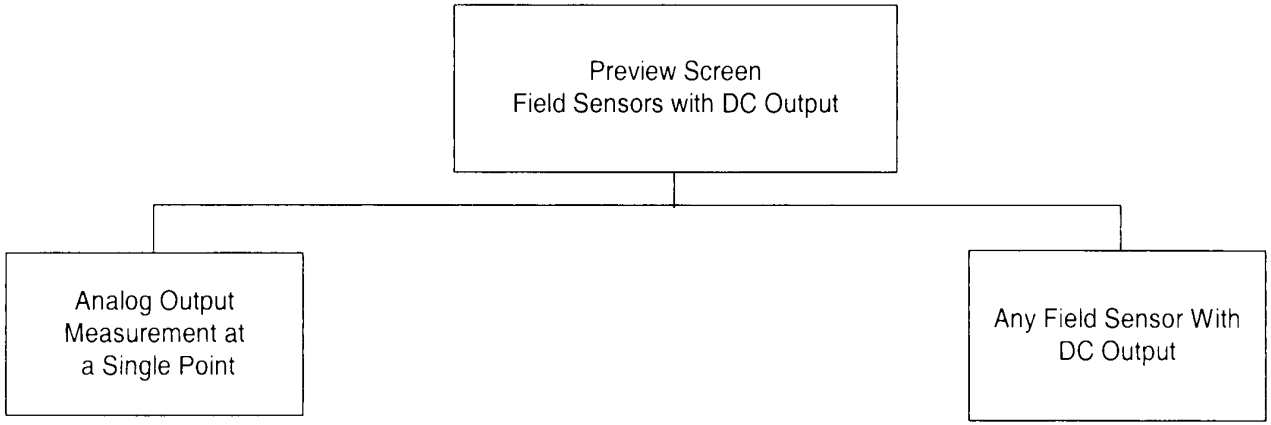

Preview Screen
Field Sensors with DC Output
Analog Output
Measurement at
a Single Point
Any Field Sensor With
DC Output

FIG. 55

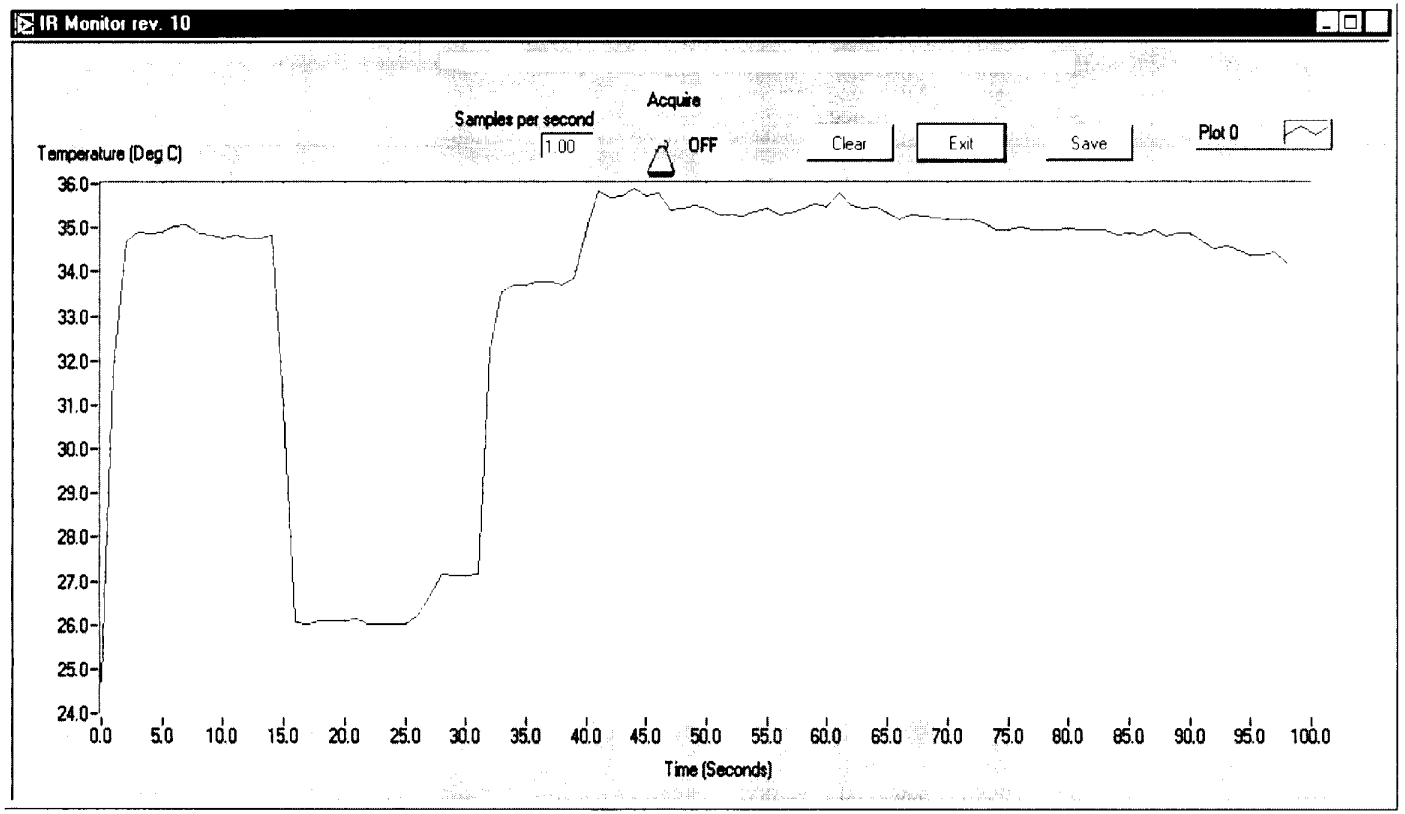
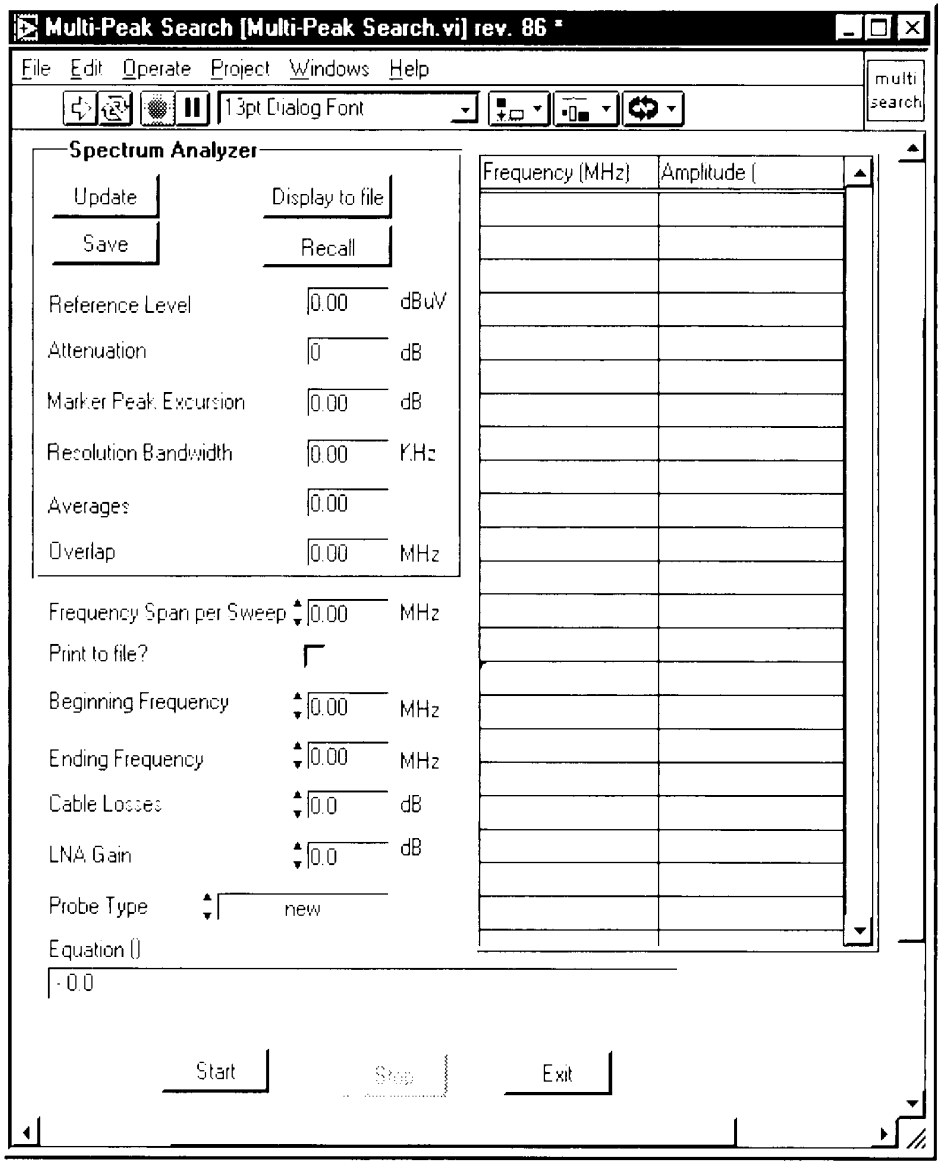

IR Monitor rev. 10
Samples per second
1.00
Acquire
OFF
Clear
Exit
Save
Plot 0
Temperature (Deg C)
36.0
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
Time (Seconds)

FIG. 56

FIG. 57


Multi-Peak Search [Multi-Peak Search.vi] rev. 86 *
File Edit Operate Project Windows Help
multi search
13pt Dialog Font
Spectrum Analyzer
Update
Display to file
Save
Recall
Reference Level
0.00
dBuV
Attenuation
0
dB
Marker Peak Excursion
0.00
dB
Resolution Bandwidth
0.00
KHz
Averages
0.00
Overlap
0.00
MHz
Frequency Span per Sweep
0.00
MHz
Print to file?
Beginning Frequency
0.00
MHz
Ending Frequency
0.00
MHz
Cable Losses
0.0
dB
LNA Gain
0.0
dB
Probe Type
new
Equation ()
0.0
Frequency (MHz)
Amplitude (
Start
Stop
Exit

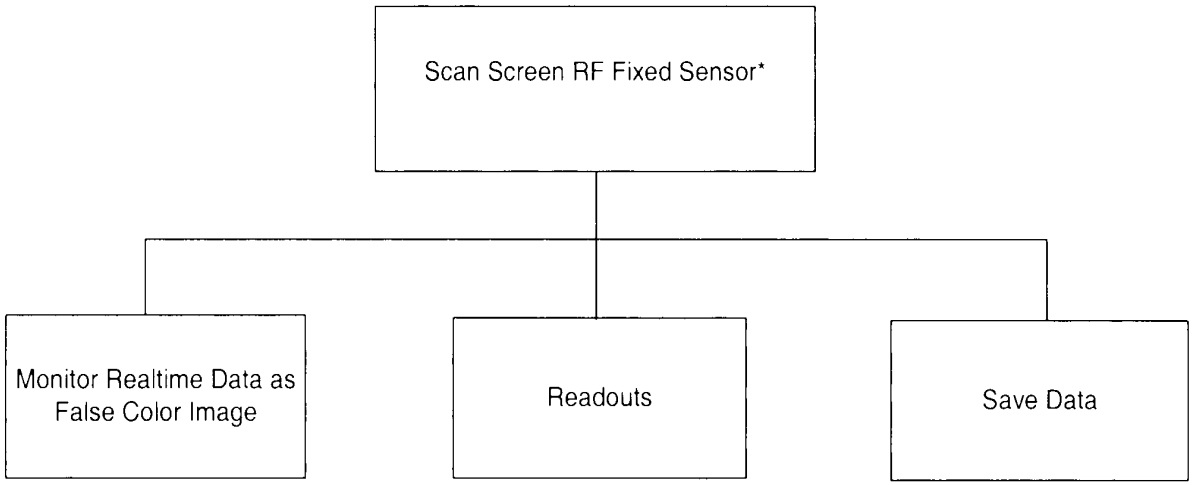

Scan Screen RF Fixed Sensor*
Monitor Realtime Data as False Color Image
Readouts
Save Data

FIG. 58

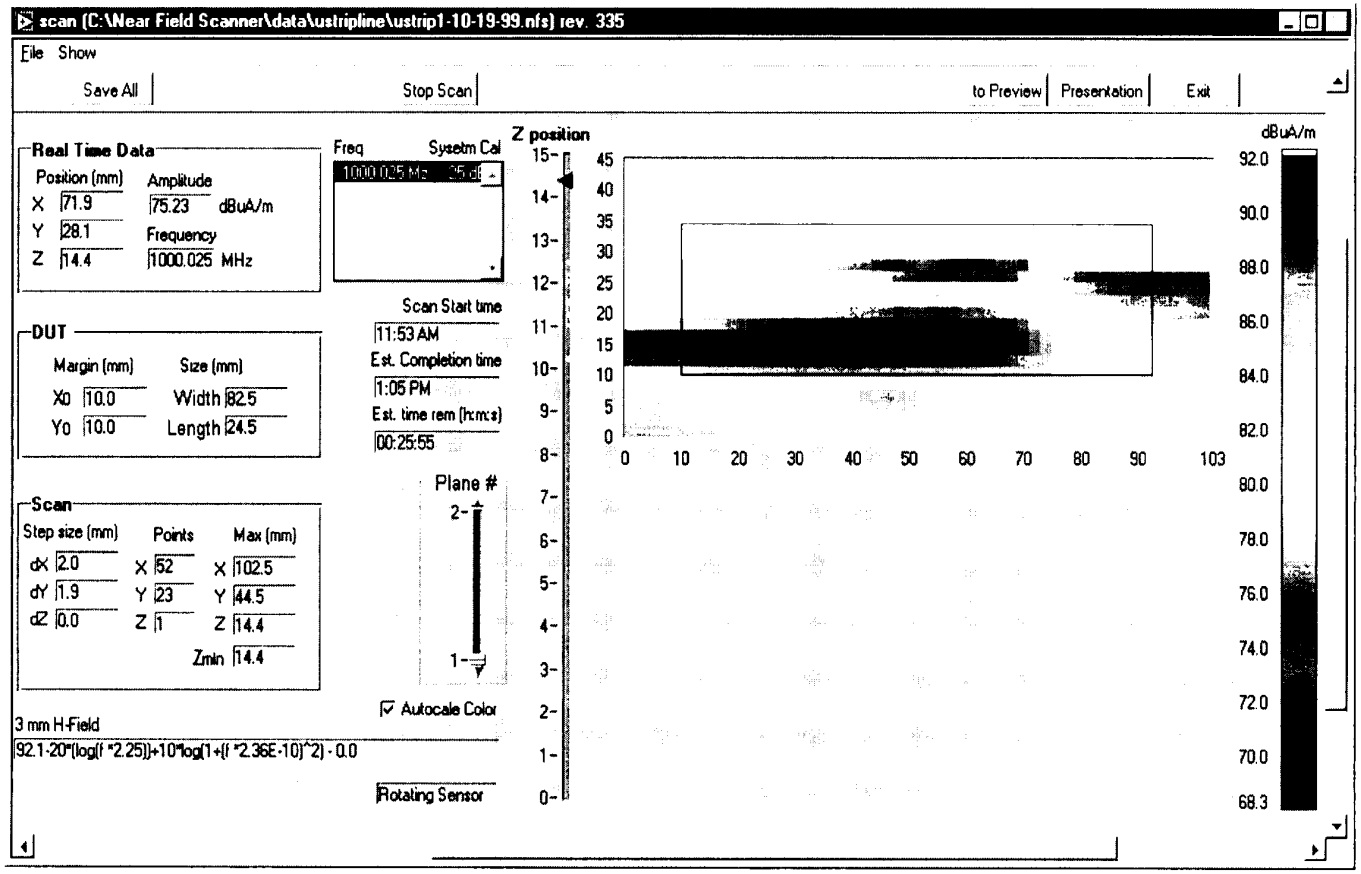
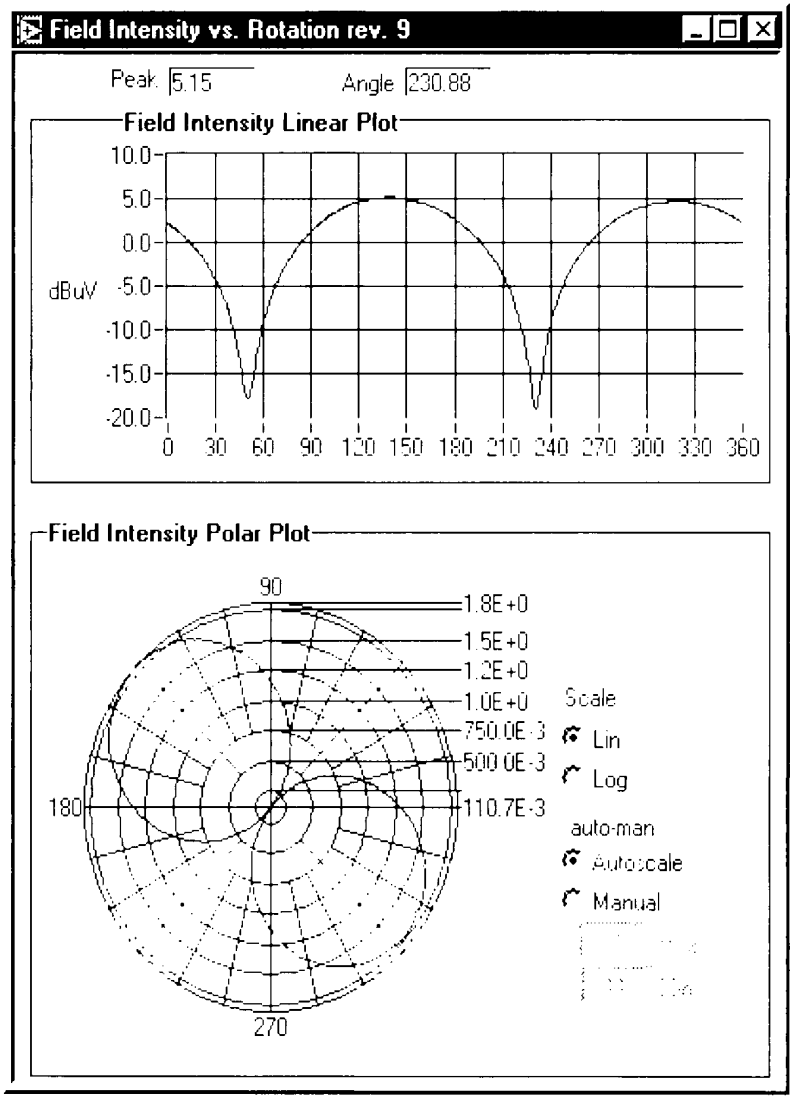

scan (C:\Near Field Scanner\data\ustripline\ustrip1-10-19-99.nfs) rev. 335
File Show
Save All
Stop Scan
to Preview
Presentation
Exit
Real Time Data
Position (mm)
Amplitude
X 71.9
75.23 dBuA/m
Y 28.1
Frequency
Z 14.4
1000.025 MHz
Freq
Systm Cal
1000.025 MHz
DUT
Margin (mm)
Size (mm)
Xo 10.0
Width 82.5
Yo 10.0
Length 24.5
Scan
Step size (mm)
Points
Max (mm)
dX 2.0
X 52
X 102.5
dY 1.9
Y 23
Y 44.5
dZ 0.0
Z 1
Z 14.4
Zmin 14.4
3 mm H-Field
92.1-20*(log(f *2.25))+10*log(1+(f *2.36E-10)^2) - 0.0
Scan Start time
11:53 AM
Est. Completion time
1:05 PM
Est. time rem (h:m:s)
00:25:55
Plane #
Autocale Color
Rotating Sensor
Z position
dBuA/m

FIG. 59

FIG. 60


Field Intensity vs. Rotation rev. 9
Peak 5.15
Angle 230.88
Field Intensity Linear Plot
10.0
5.0
0.0
dBuV -5.0
-10.0
-15.0
-20.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Field Intensity Polar Plot
90
180
270
1.8E+0
1.5E+0
1.2E+0
1.0E+0
750.0E-3
500.0E-3
110.7E-3
Scale
Lin
Log
auto-man
Autoscale
Manual

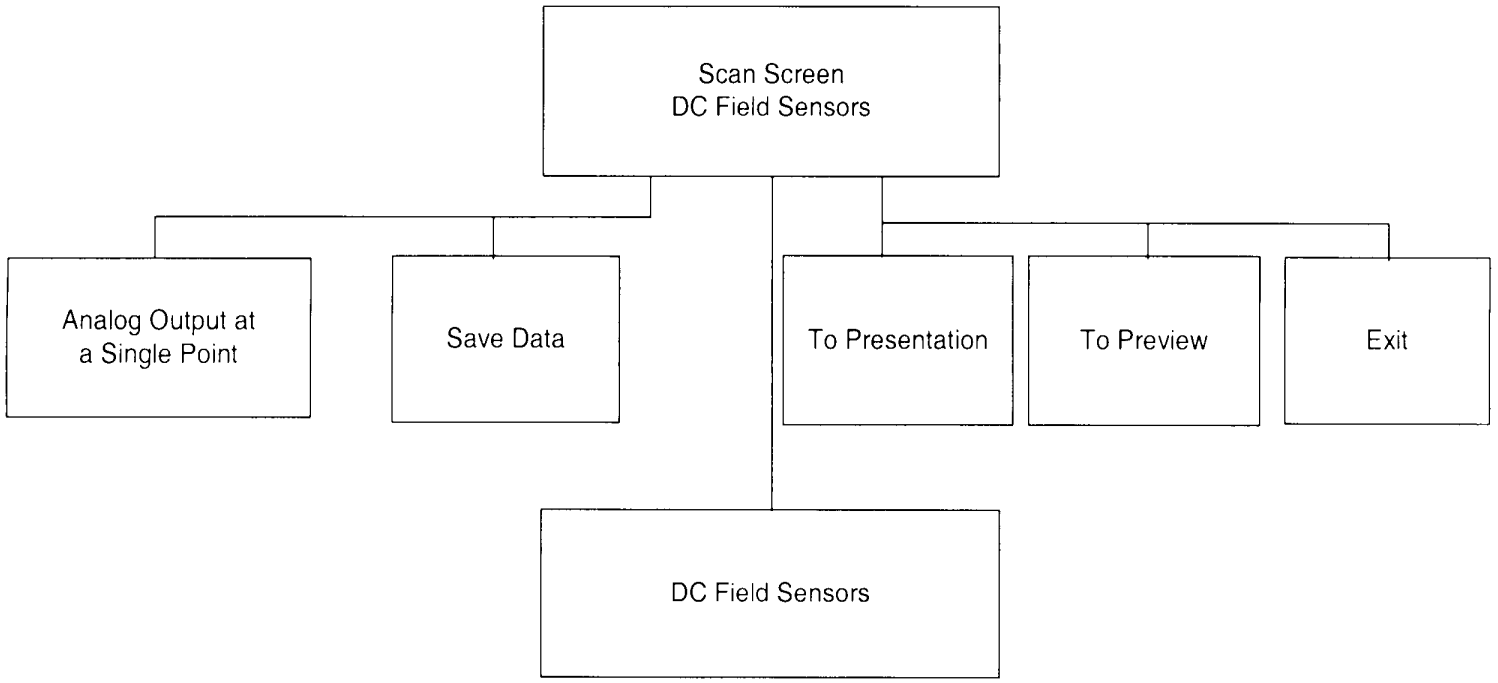

Scan Screen
DC Field Sensors
Analog Output at
a Single Point
Save Data
To Presentation
To Preview
Exit
DC Field Sensors

FIG. 61

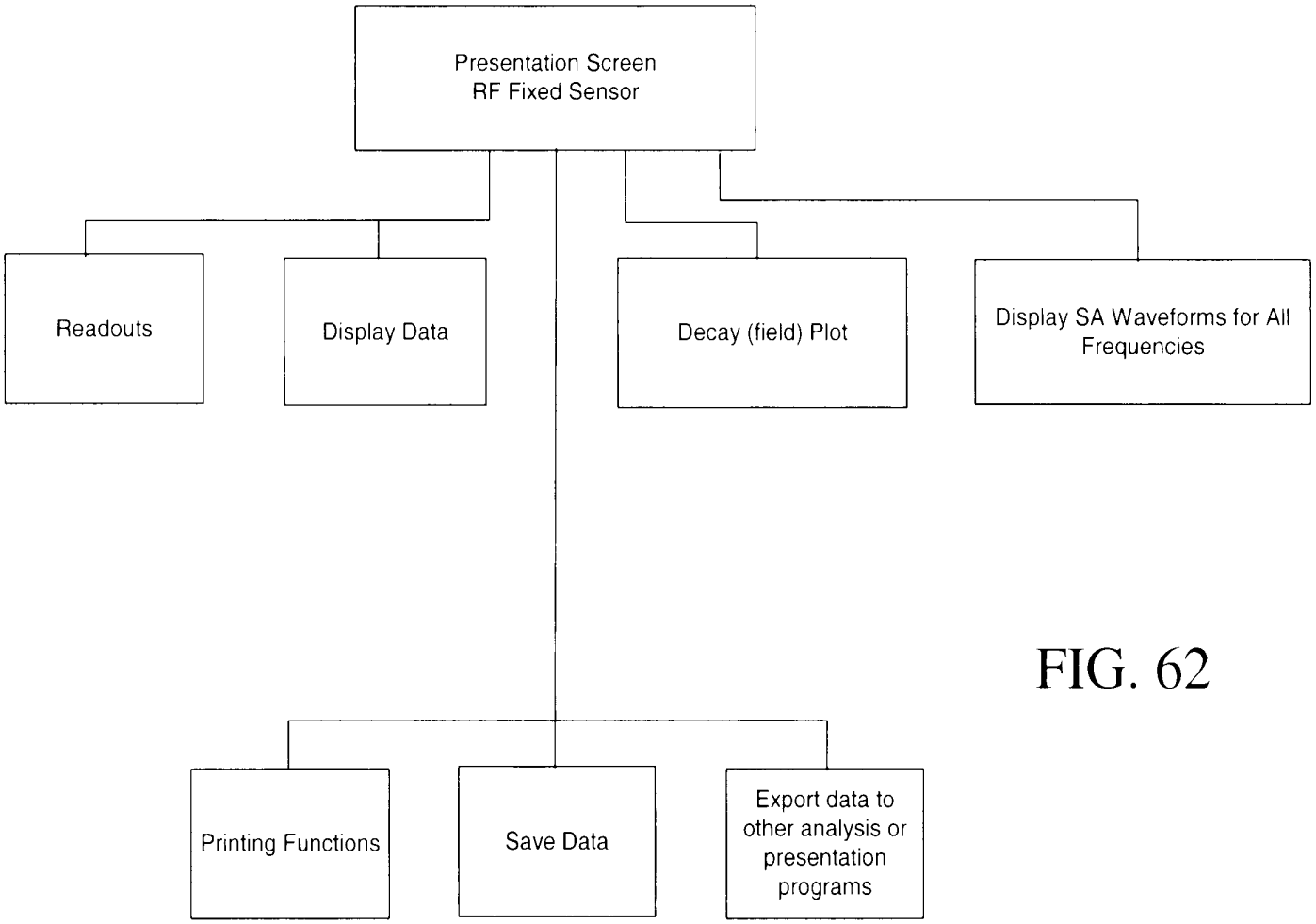

Presentation Screen
RF Fixed Sensor
Readouts
Display Data
Decay (field) Plot
Display SA Waveforms for All Frequencies
Printing Functions
Save Data
Export data to other analysis or presentation programs

FIG. 62

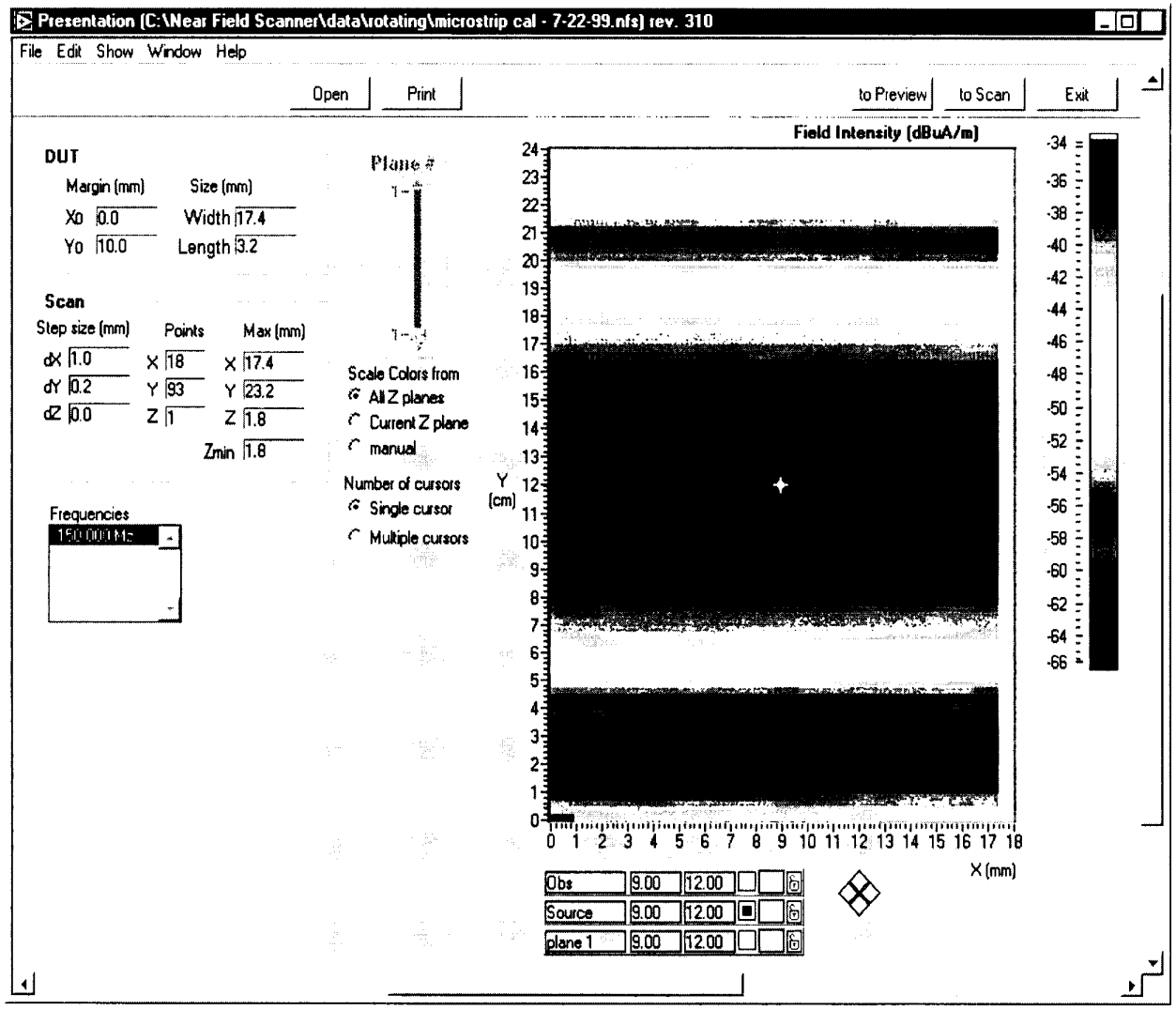
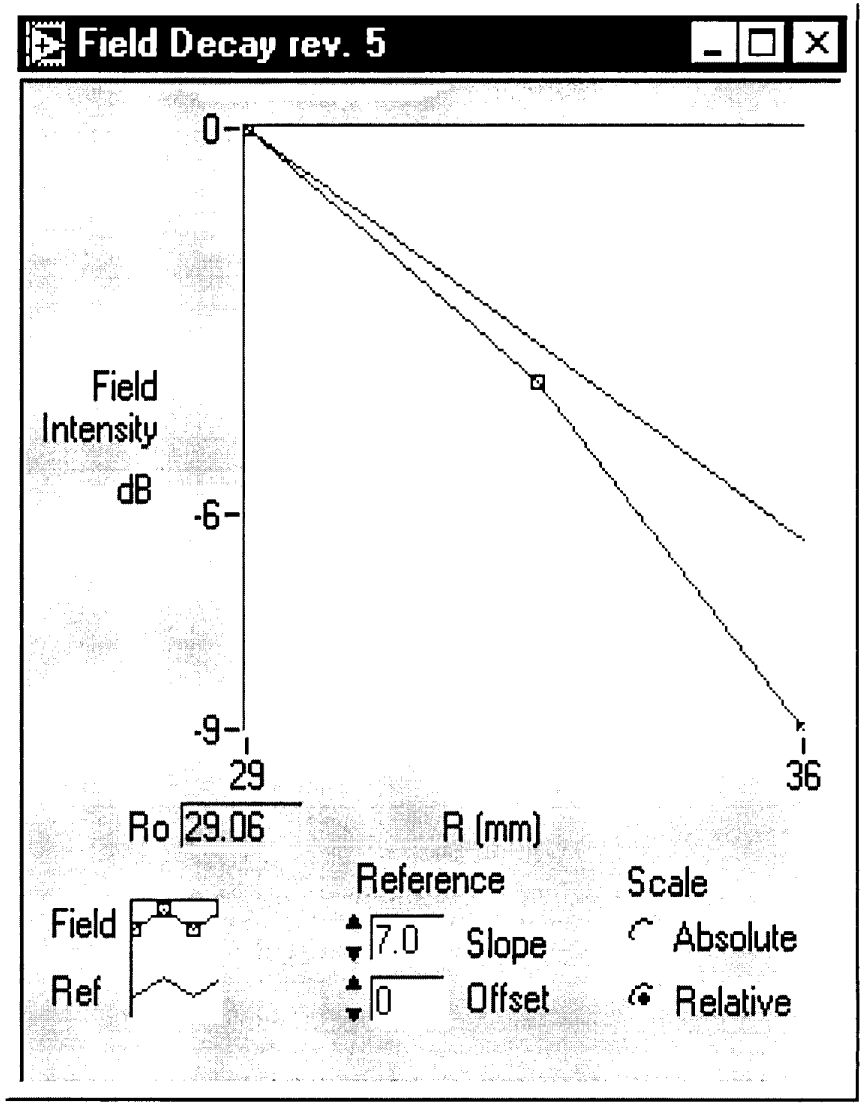

Presentation (C:\Near Field Scanner\data\rotating\microstrip cal - 7-22-99.nfs) rev. 310
File Edit Show Window Help
Open
Print
to Preview
to Scan
Exit
DUT
Margin (mm)
Size (mm)
Xo 0.0
Width 17.4
Yo 10.0
Length 3.2
Scan
Step size (mm)
Points
Max (mm)
dX 1.0
X 18
X 17.4
dY 0.2
Y 93
Y 23.2
dZ 0.0
Z 1
Z 1.8
Zmin 1.8
Frequencies
Plane #
Scale Colors from
All Z planes
Current Z plane
manual
Number of cursors
Single cursor
Multiple cursors
Field Intensity (dBuA/m)
Y (cm)
X (mm)
Obs 9.00 12.00
Source 9.00 12.00
plane 1 9.00 12.00

FIG. 63

FIG. 64


Field Decay rev. 5
0
-6-
-9-
Field
Intensity
dB
29
36
Ro 29.06
R (mm)
Reference
Scale
Field
Ref
7.0
Slope
Absolute
0
Offset
Relative

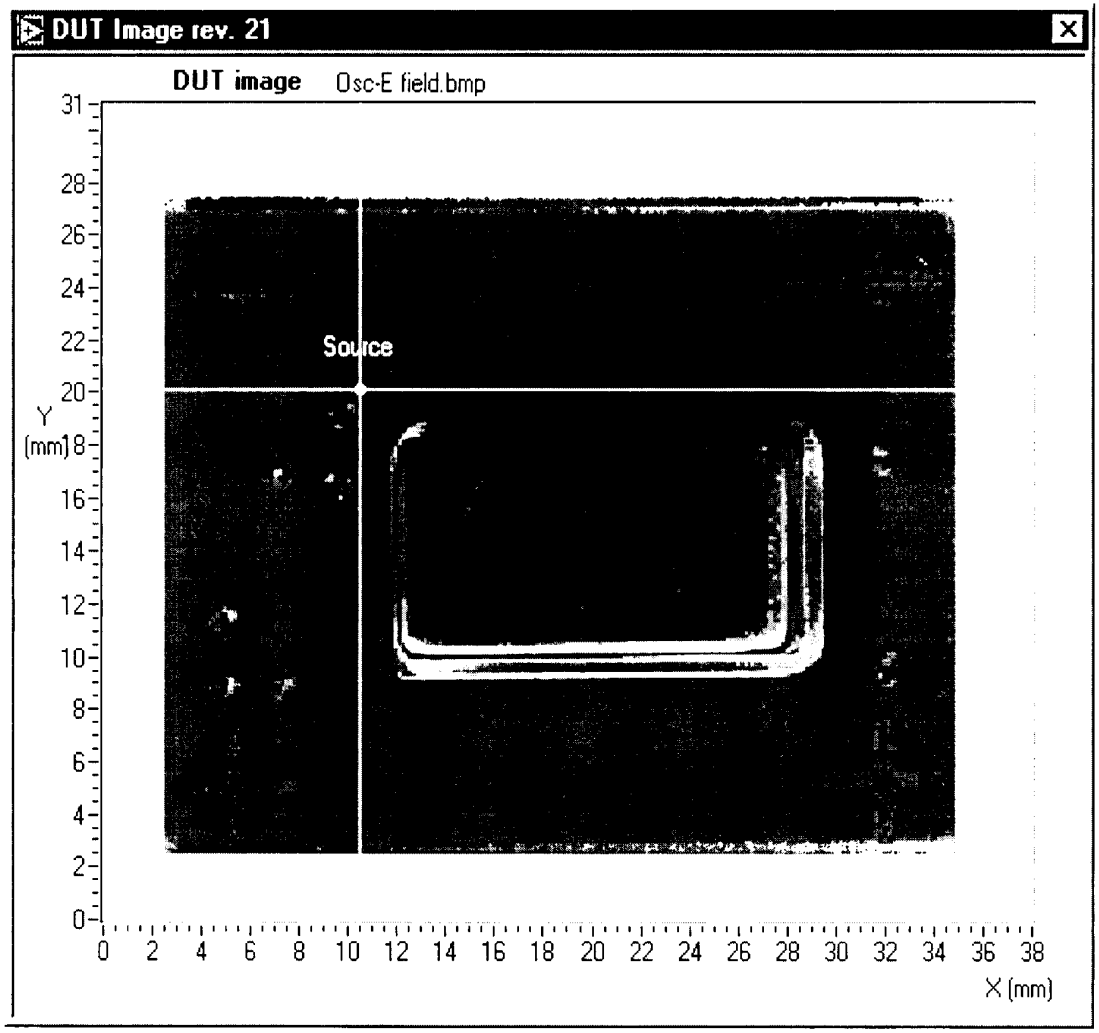
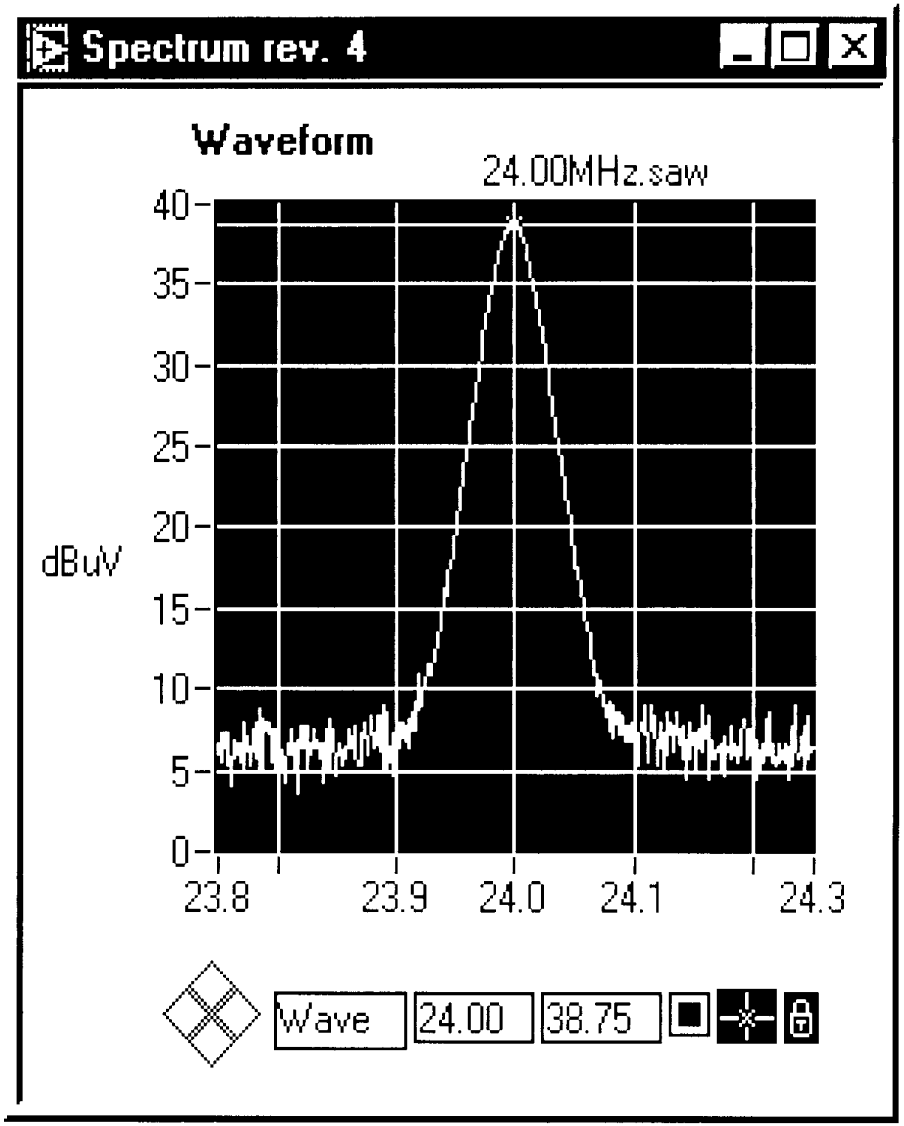

DUT Image rev. 21
DUT image
Osc-E field.bmp
Source
Y (mm)
X (mm)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 31

FIG. 65

FIG. 66


Spectrum rev. 4
Waveform
24.00MHz.saw
dBuV
40
35
30
25
20
15
10
5
0
23.8
23.9
24.0
24.1
24.3
Wave
24.00
38.75

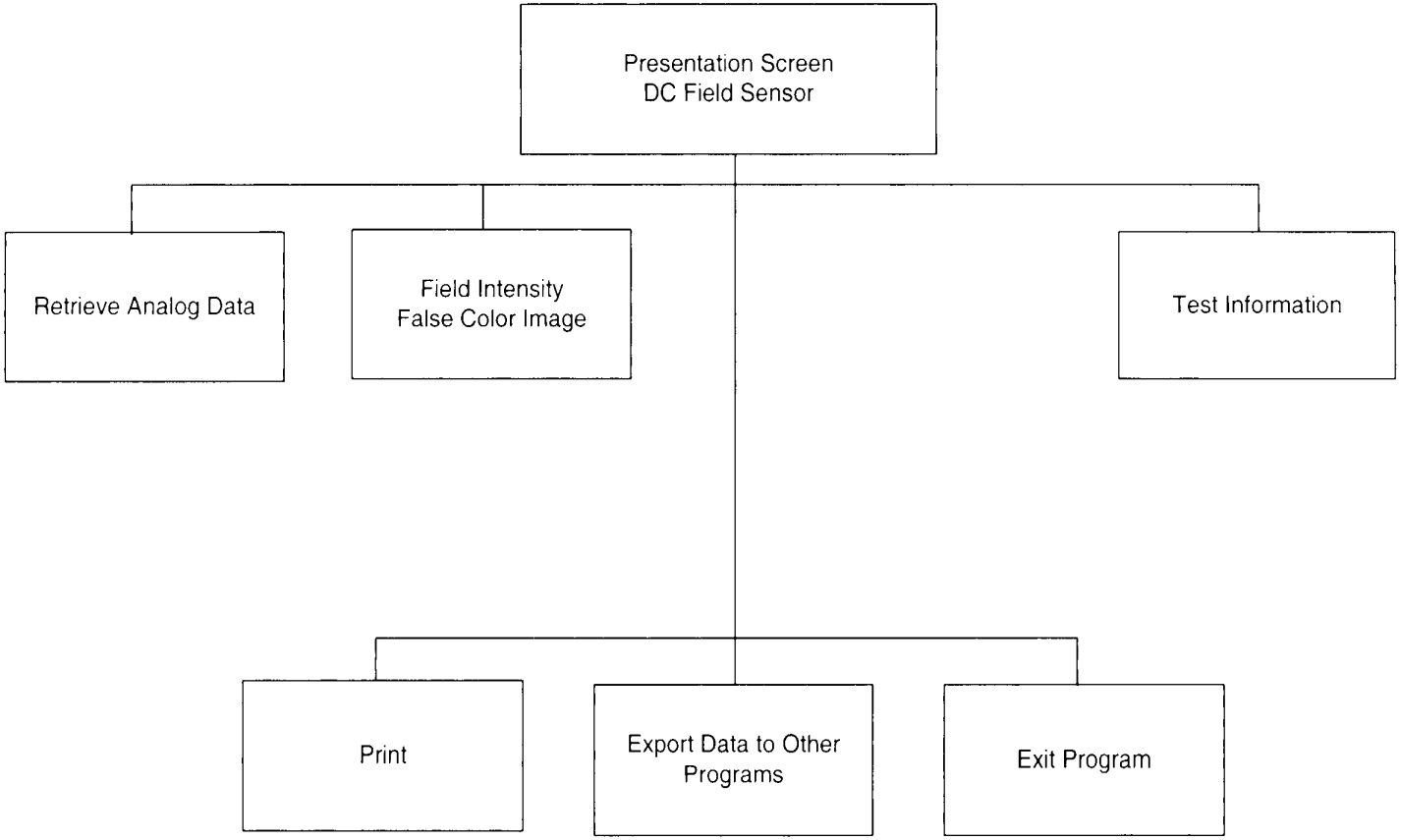

Presentation Screen
DC Field Sensor
Retrieve Analog Data
Field Intensity
False Color Image
Test Information
Print
Export Data to Other
Programs
Exit Program

FIG. 67

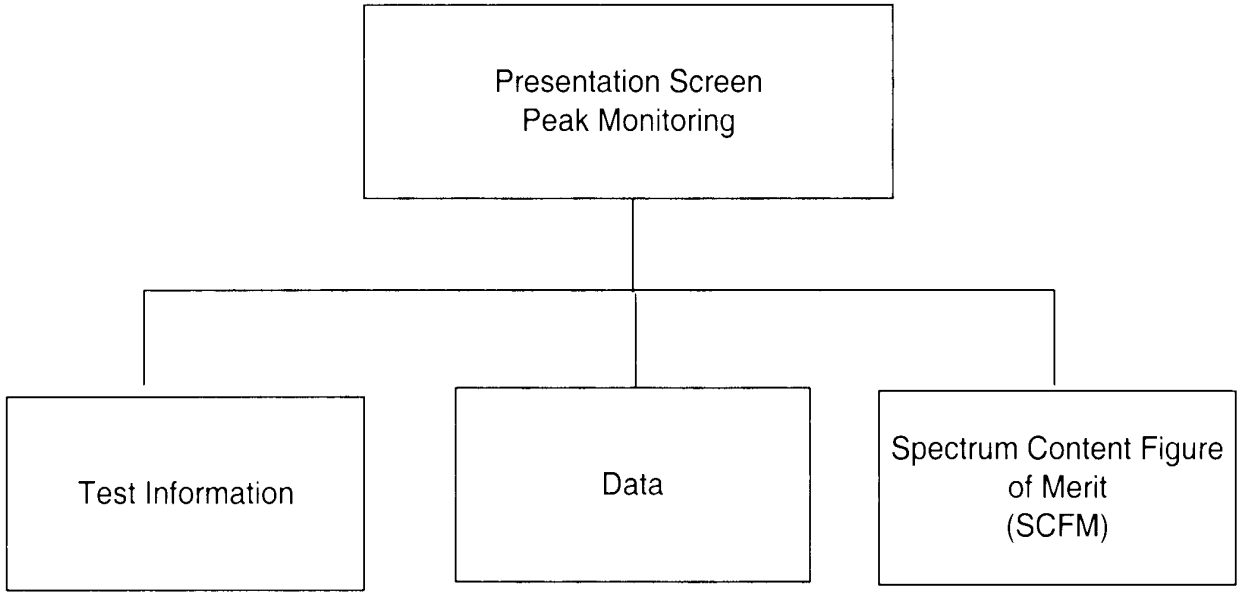

Presentation Screen
Peak Monitoring
Test Information
Data
Spectrum Content Figure
of Merit
(SCFM)

FIG. 68

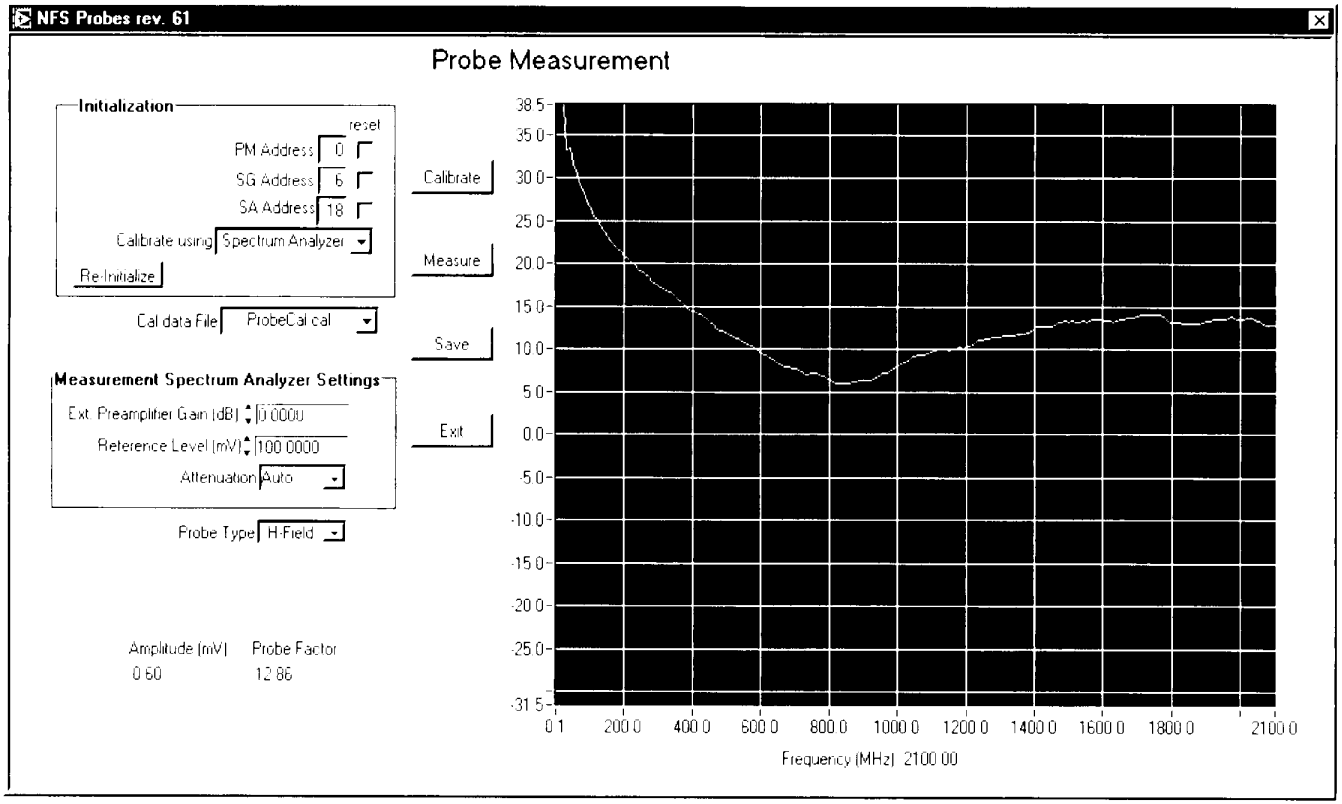

NFS Probes rev. 61
Probe Measurement
Initialization
reset
PM Address 0
SG Address 6
SA Address 18
Calibrate using Spectrum Analyzer
Re-Initialize
Cal data File ProbeCal.cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain [dB] 0.0000
Reference Level [mV] 100.0000
Attenuation Auto
Probe Type H-Field
Amplitude [mV] Probe Factor
0.60 12.86
Calibrate
Measure
Save
Exit
38.5
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-31.5
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency [MHz] 2100.00

FIG. 69

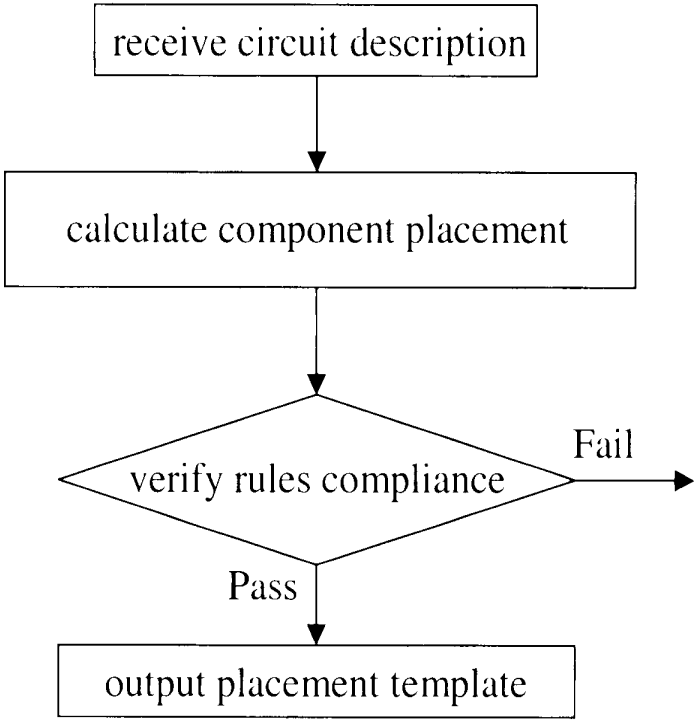


FIG. 70 (RELATED ART)

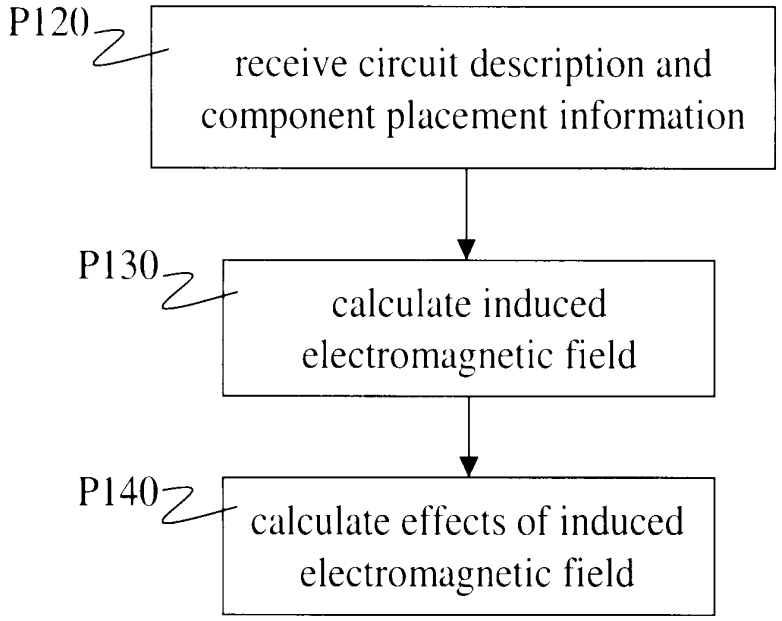

P120
receive circuit description and component placement information
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field

FIG. 71

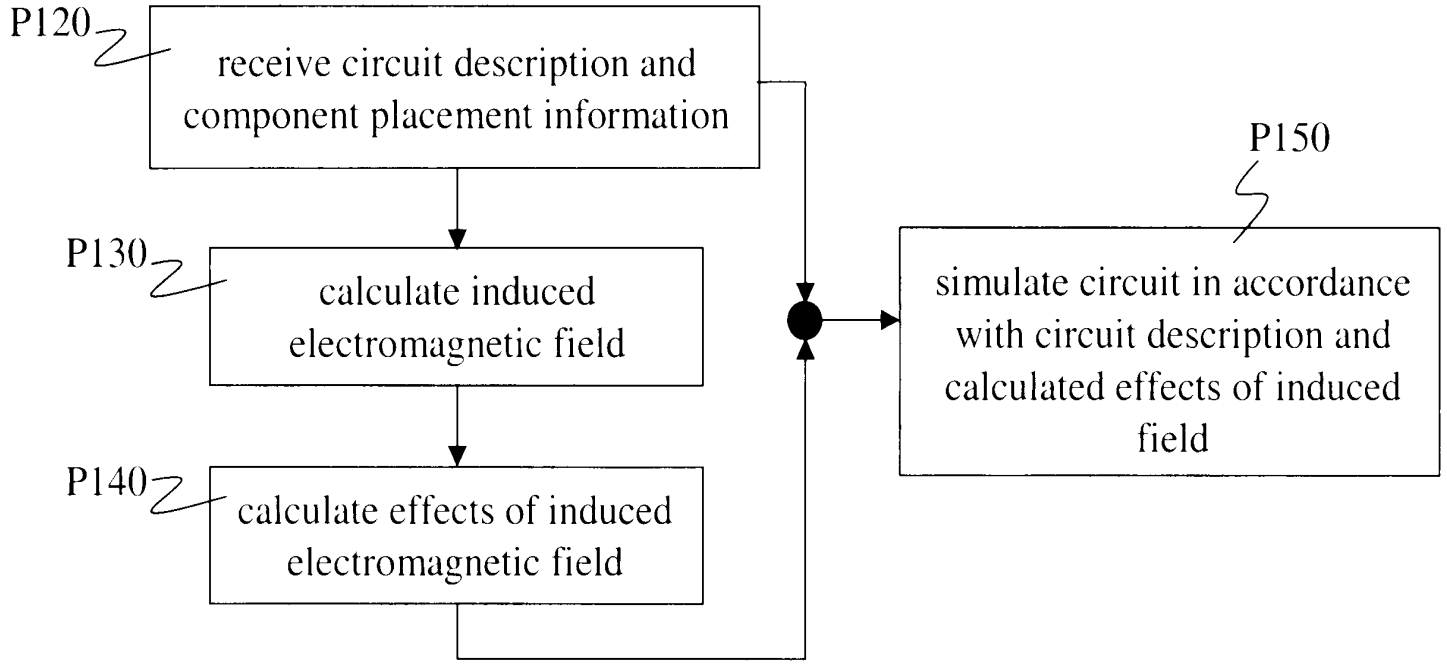

P120
receive circuit description and component placement information
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P150
simulate circuit in accordance with circuit description and calculated effects of induced field

FIG. 72

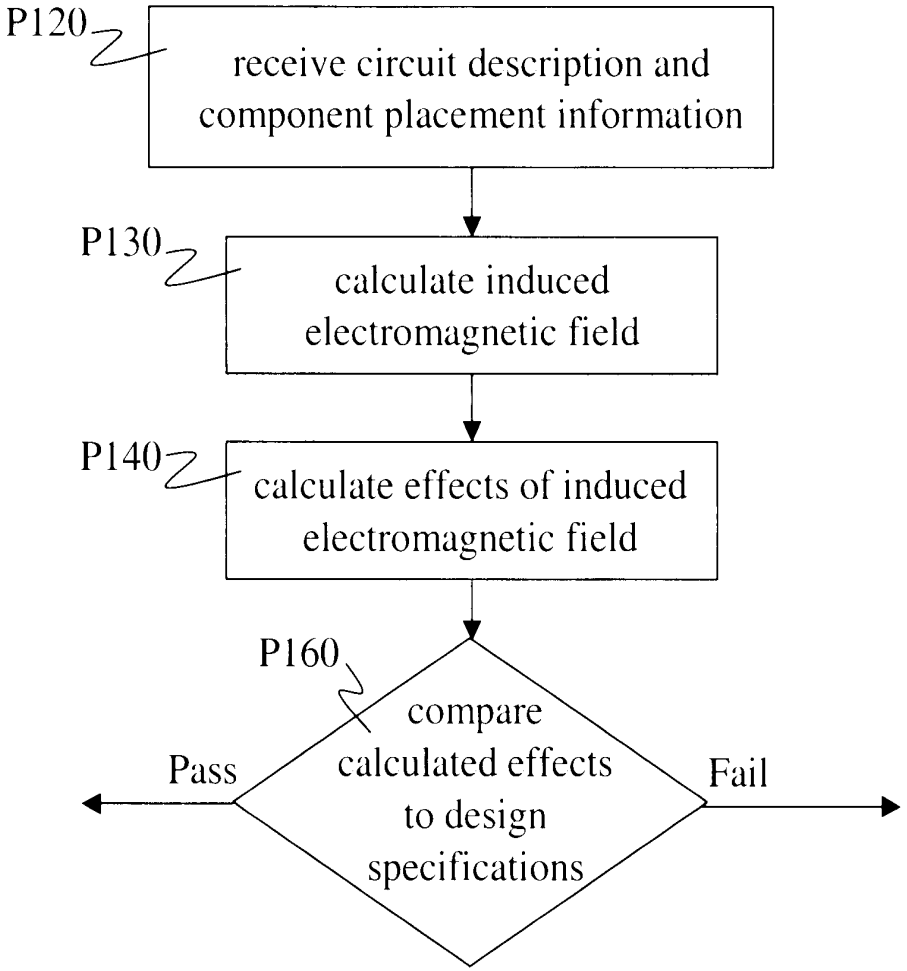

P120
receive circuit description and component placement information
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P160
compare calculated effects to design specifications
Pass
Fail

FIG. 73

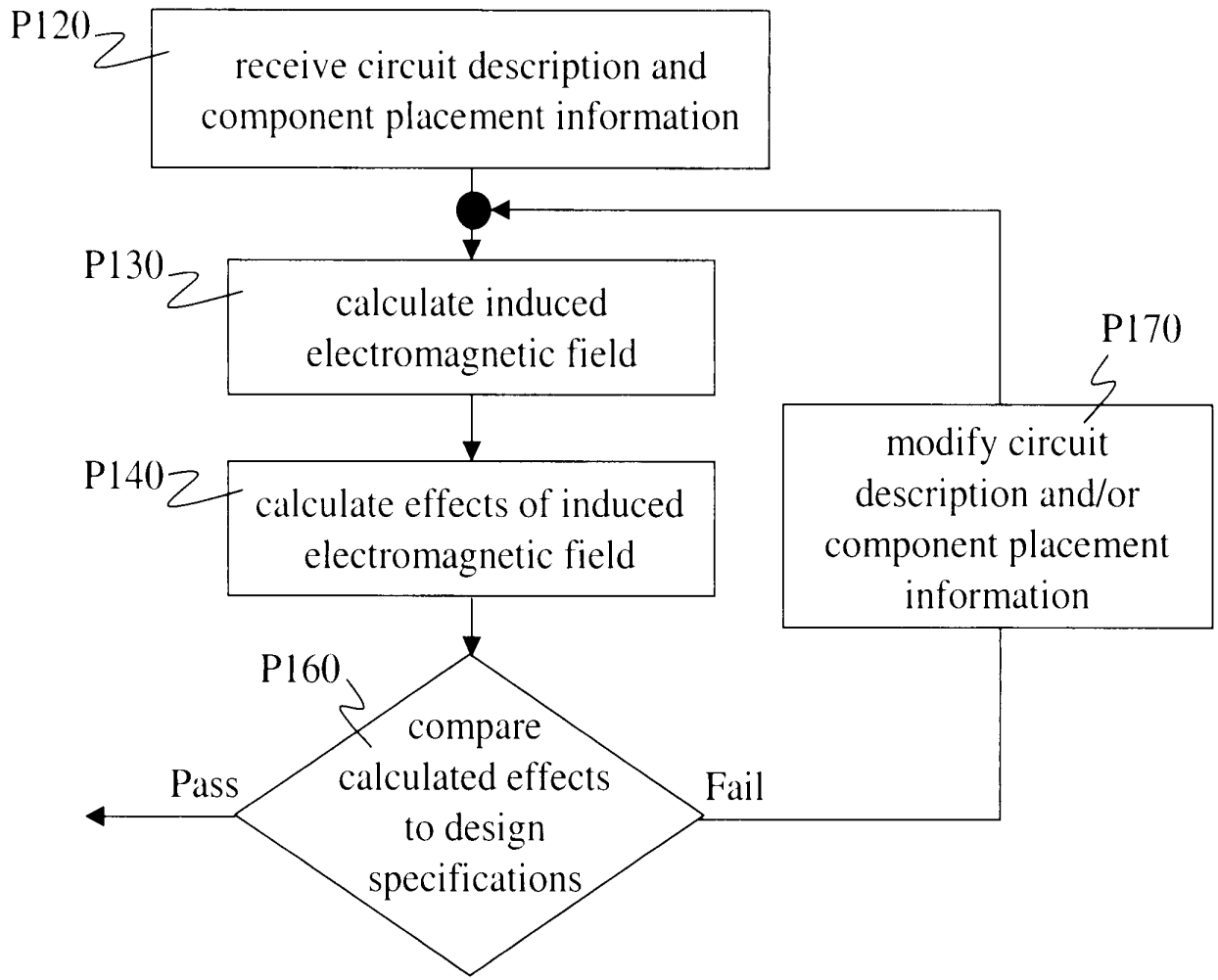

P120
receive circuit description and component placement information
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P160
compare calculated effects to design specifications
Pass
Fail
P170
modify circuit description and/or component placement information

FIG. 74

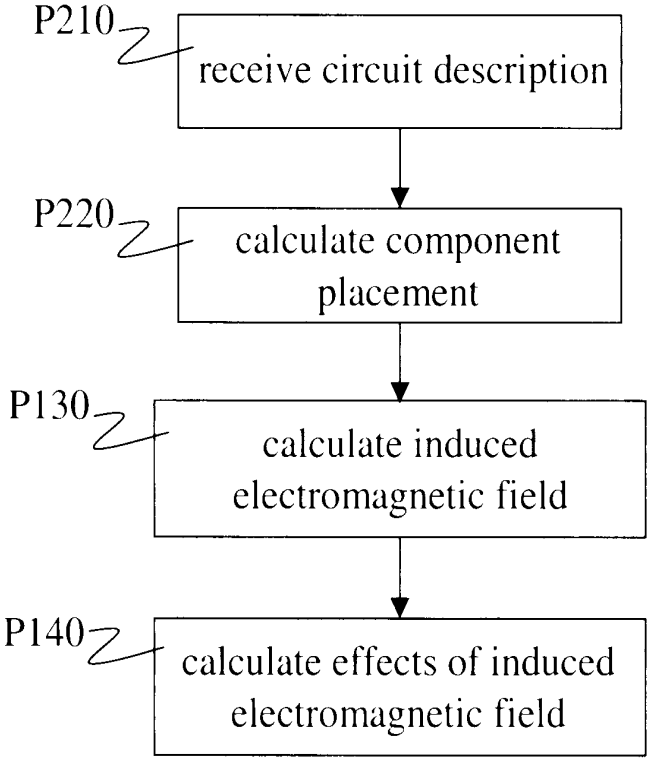

P210
receive circuit description
P220
calculate component placement
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field

FIG. 75

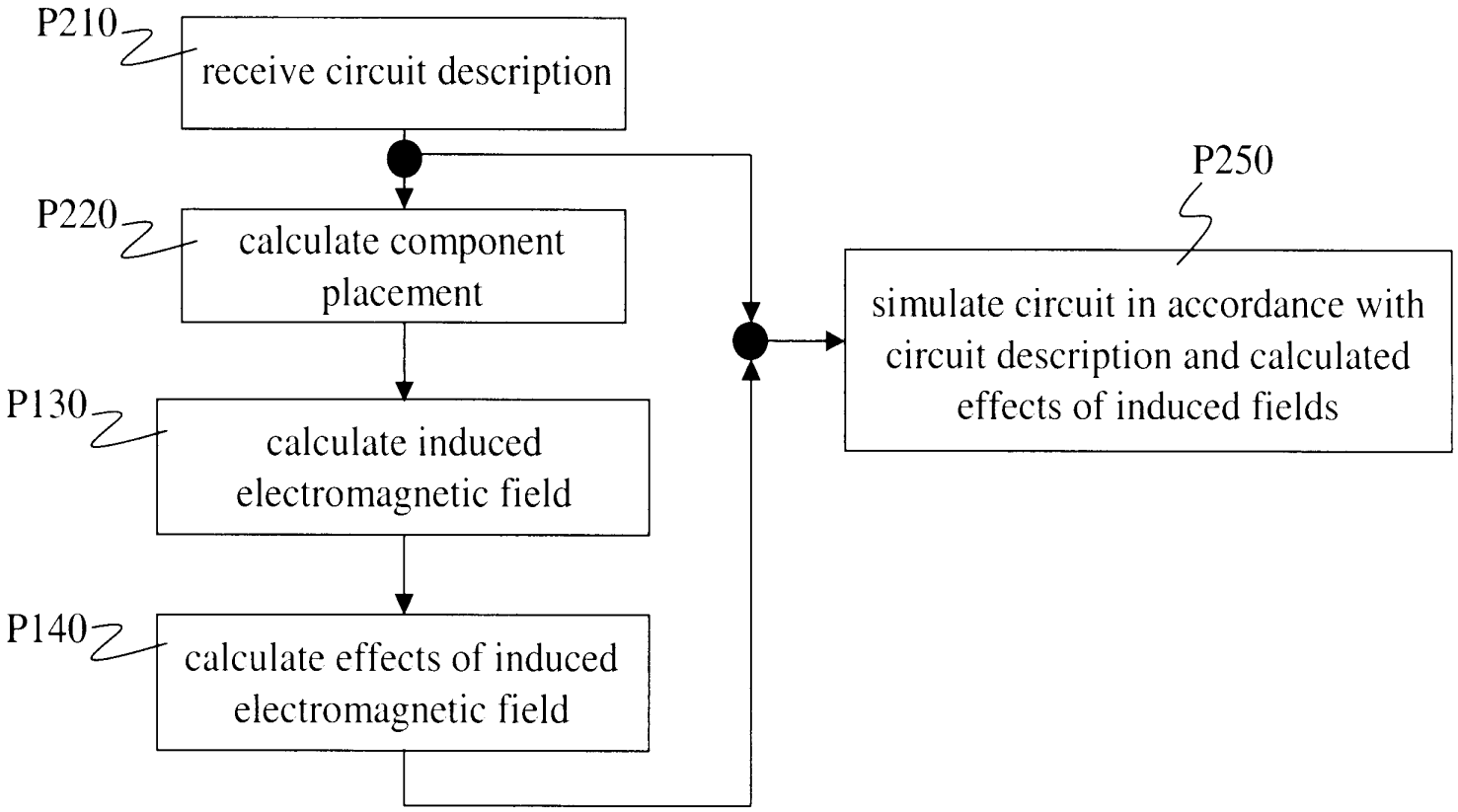

P210
receive circuit description
P220
calculate component placement
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P250
simulate circuit in accordance with circuit description and calculated effects of induced fields

FIG. 76

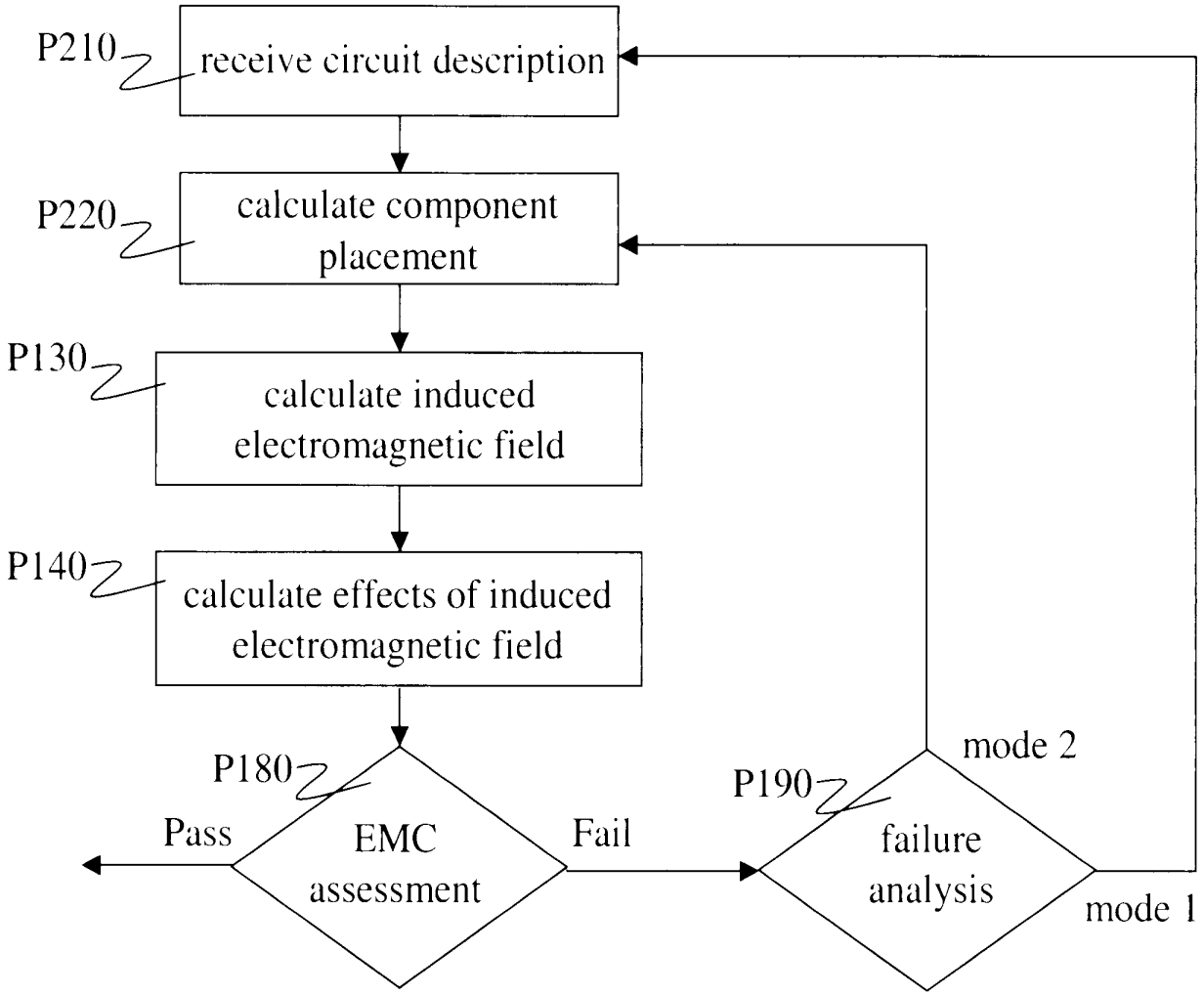

P210
receive circuit description
P220
calculate component placement
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P180
EMC assessment
Pass
Fail
P190
failure analysis
mode 2
mode 1

FIG. 77

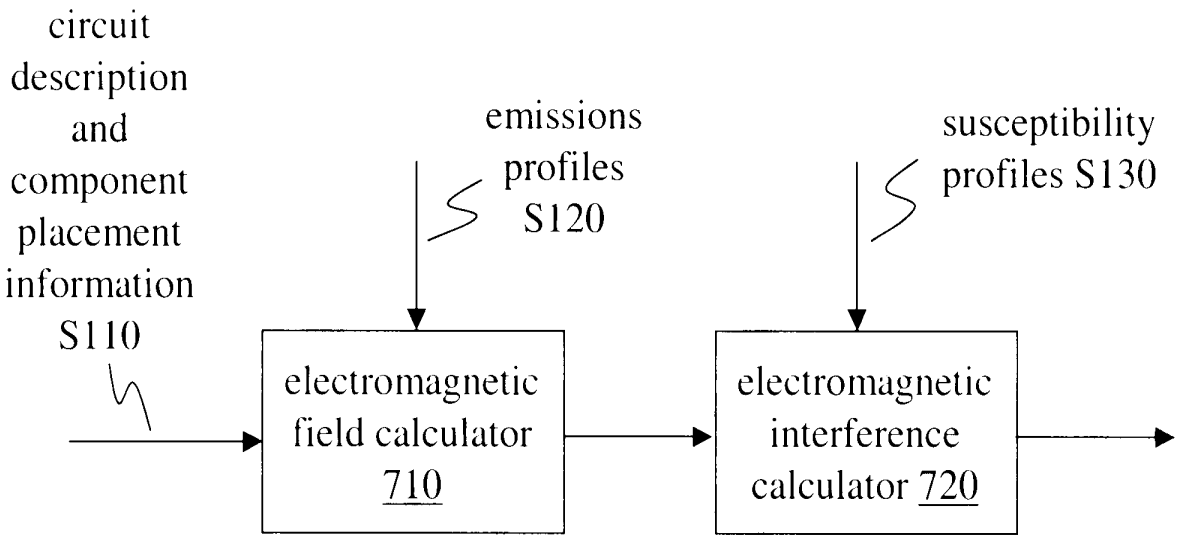

circuit description and component placement information S110
emissions profiles S120
susceptibility profiles S130
electromagnetic field calculator 710
electromagnetic interference calculator 720

FIG. 78

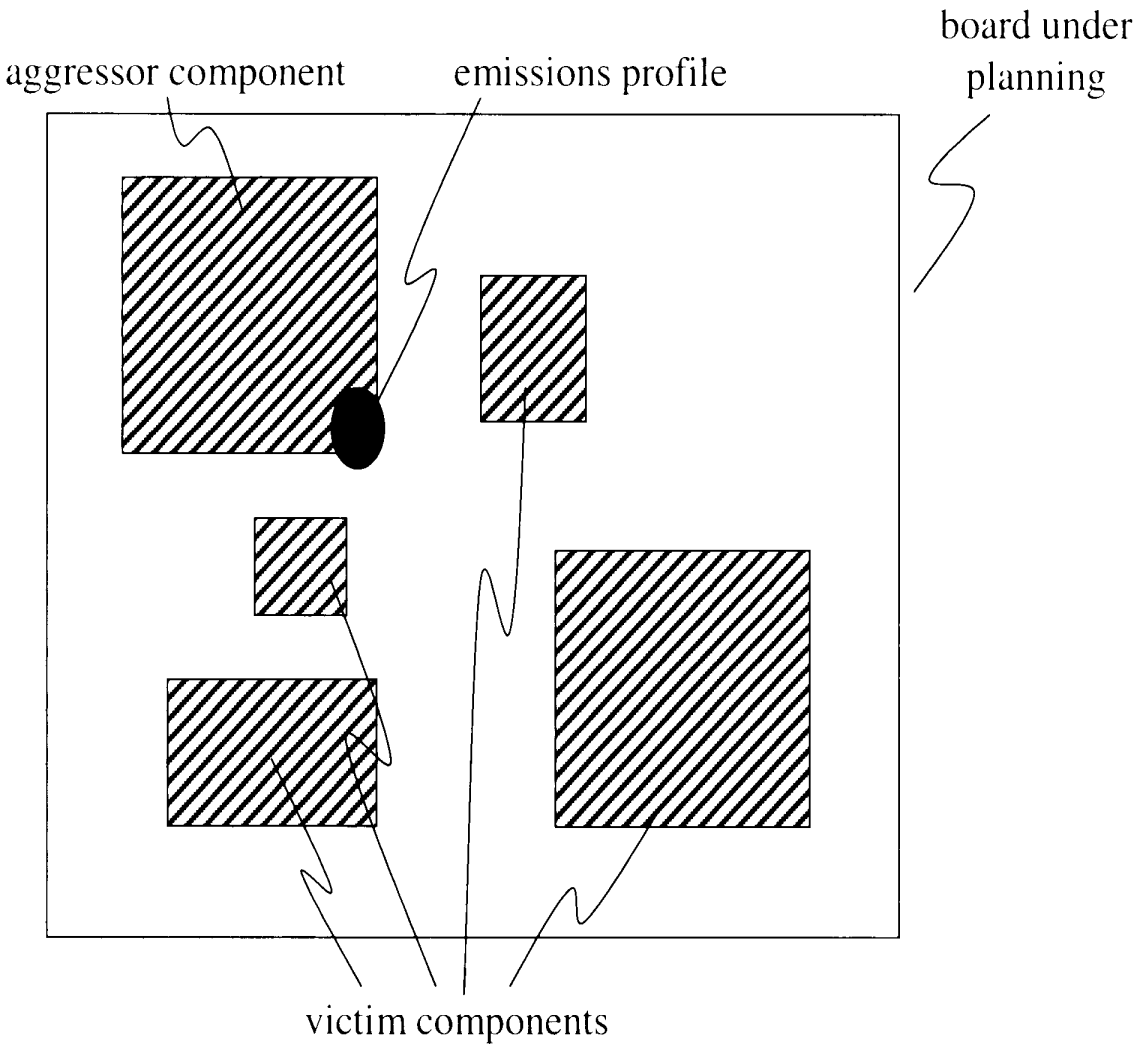

aggressor component
emissions profile
board under planning
victim components

FIG. 79

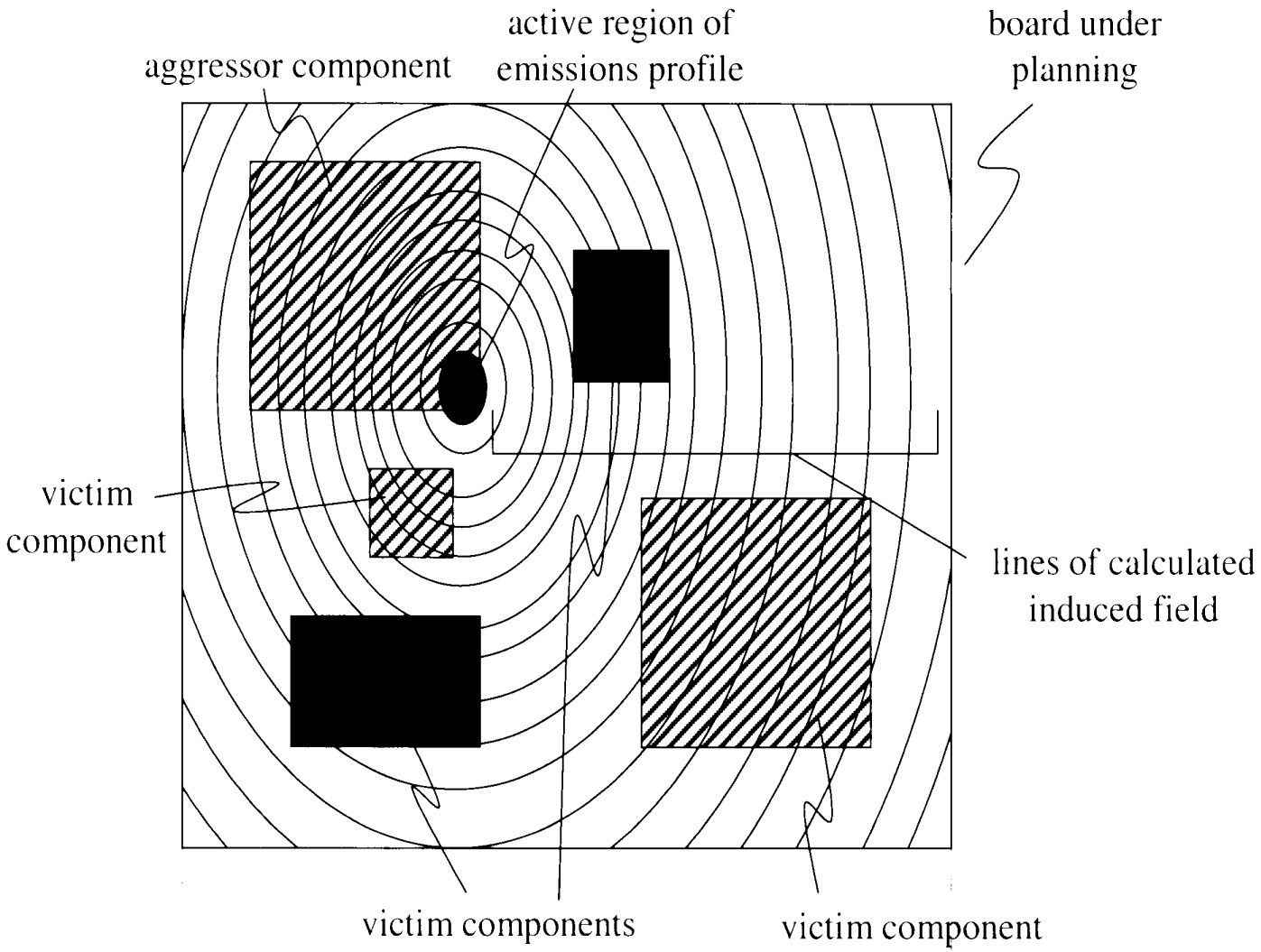

aggressor component
active region of emissions profile
board under planning
victim component
lines of calculated induced field
victim components
victim component

FIG. 80

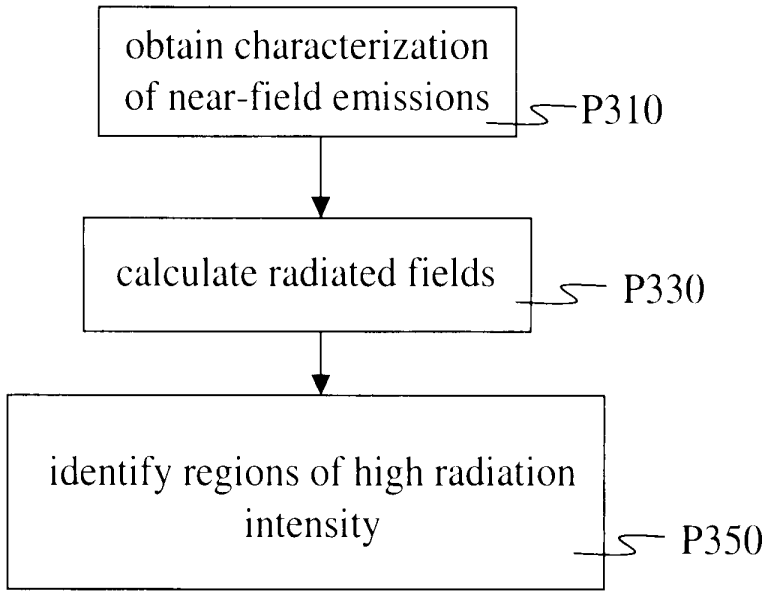

obtain characterization of near-field emissions
P310
calculate radiated fields
P330
identify regions of high radiation intensity
P350

FIG. 81

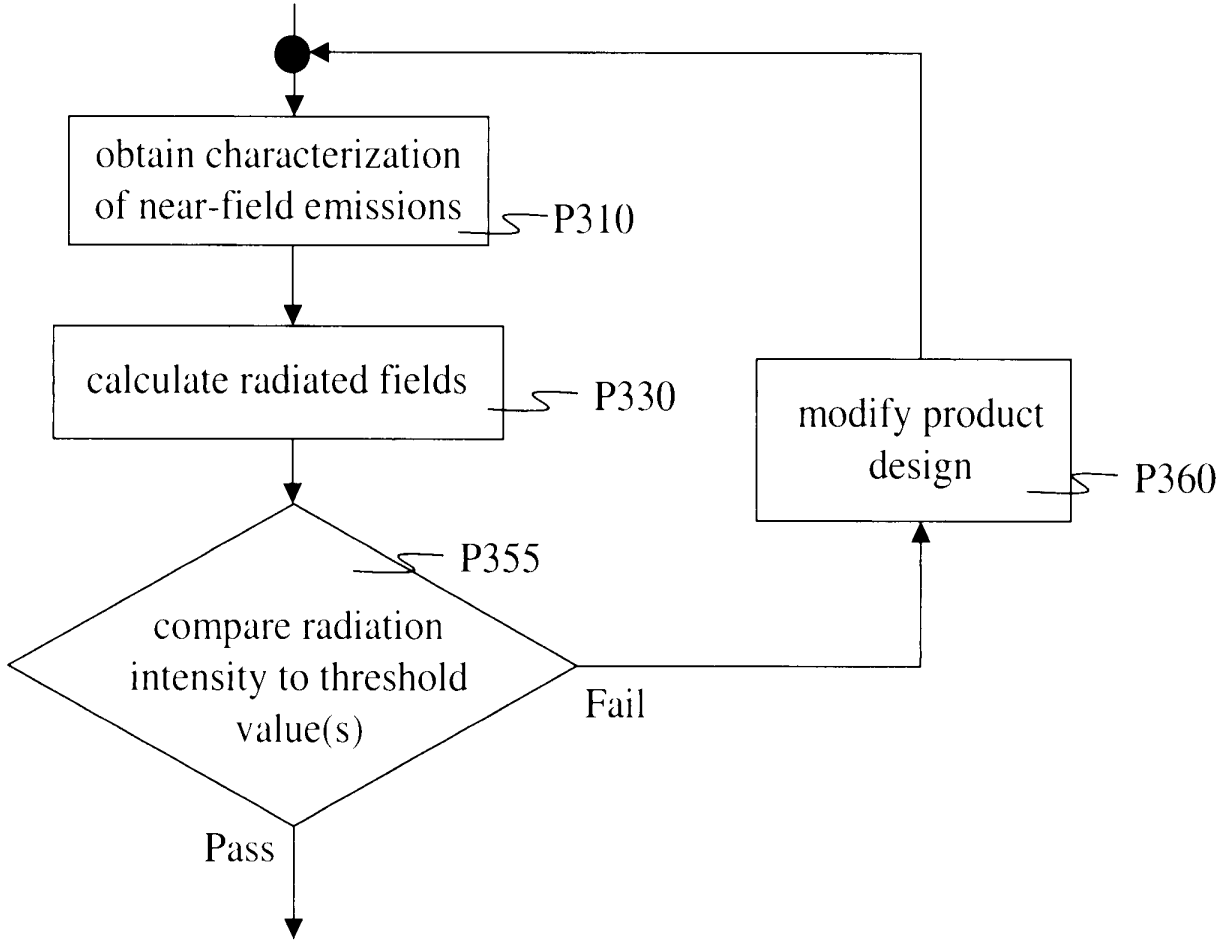

obtain characterization of near-field emissions
P310
calculate radiated fields
P330
P355
compare radiation intensity to threshold value(s)
Fail
Pass
modify product design
P360

FIG. 82

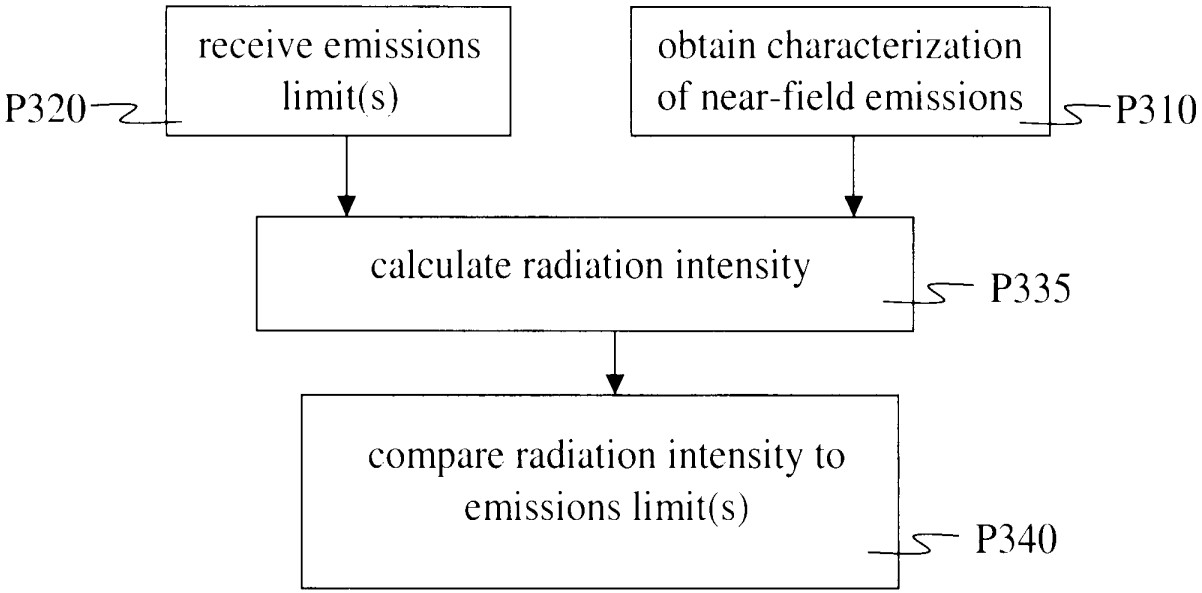

receive emissions limit(s)
P320
obtain characterization of near-field emissions
P310
calculate radiation intensity
P335
compare radiation intensity to emissions limit(s)
P340

FIG. 83

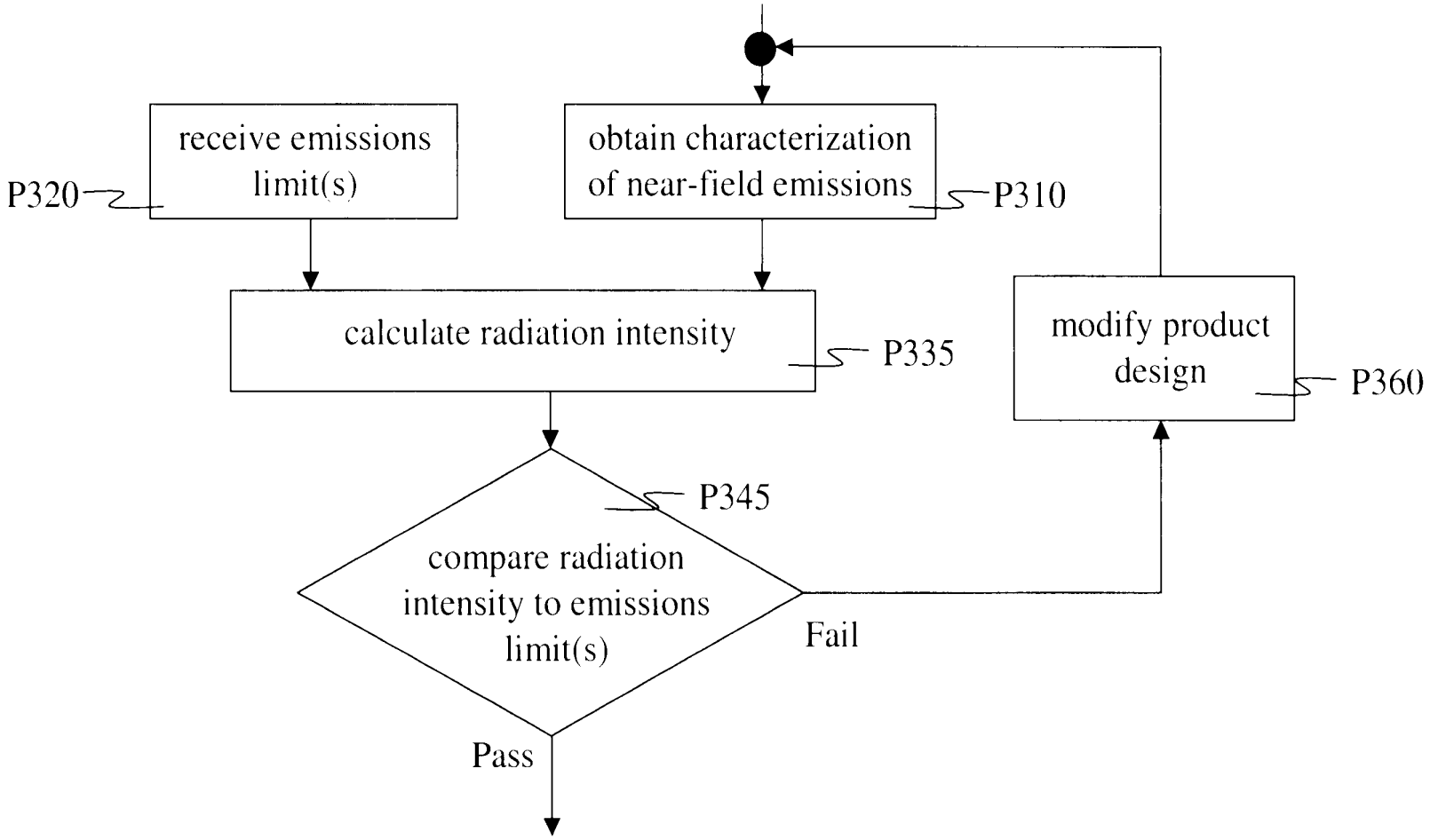

receive emissions limit(s)
P320
obtain characterization of near-field emissions
P310
calculate radiation intensity
P335
modify product design
P360
P345
compare radiation intensity to emissions limit(s)
Fail
Pass

FIG. 84

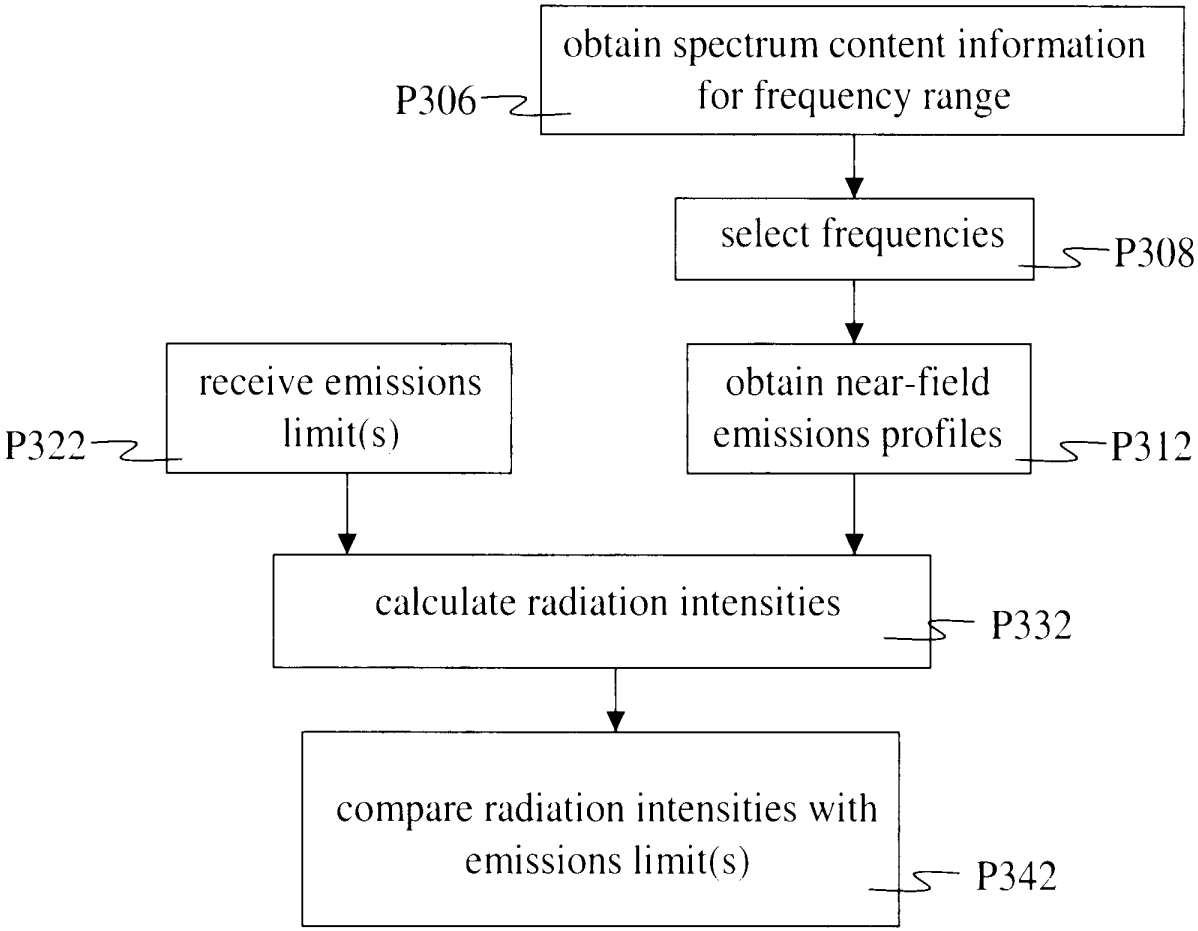
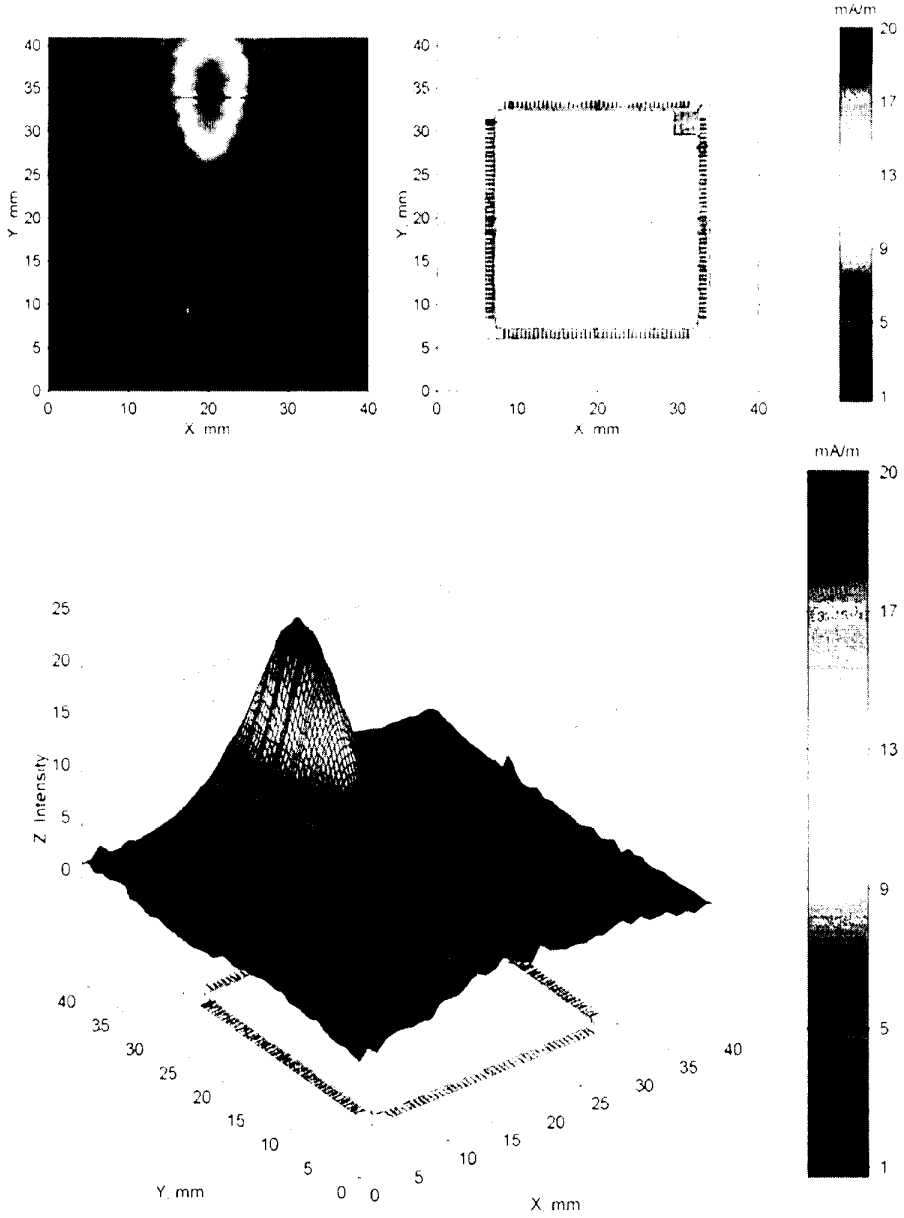

obtain spectrum content information for frequency range
P306
select frequencies
P308
receive emissions limit(s)
P322
obtain near-field emissions profiles
P312
calculate radiation intensities
P332
compare radiation intensities with emissions limit(s)
P342

FIG. 85

FIG. 86



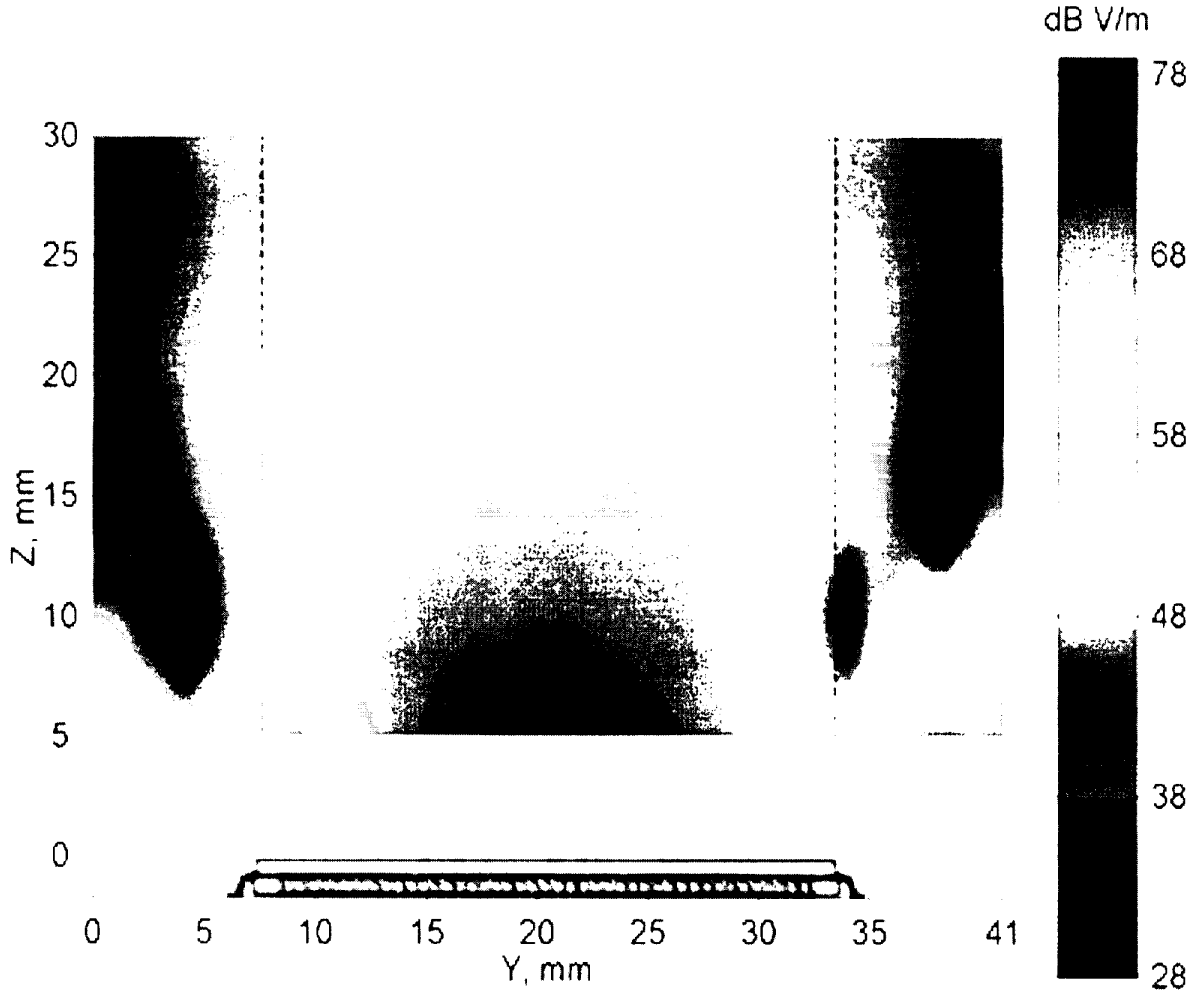

dB V/m
78
68
58
48
38
28
30
25
20
15
10
5
0
Z, mm
0
5
10
15
20
25
30
35
41
Y, mm

FIG. 87

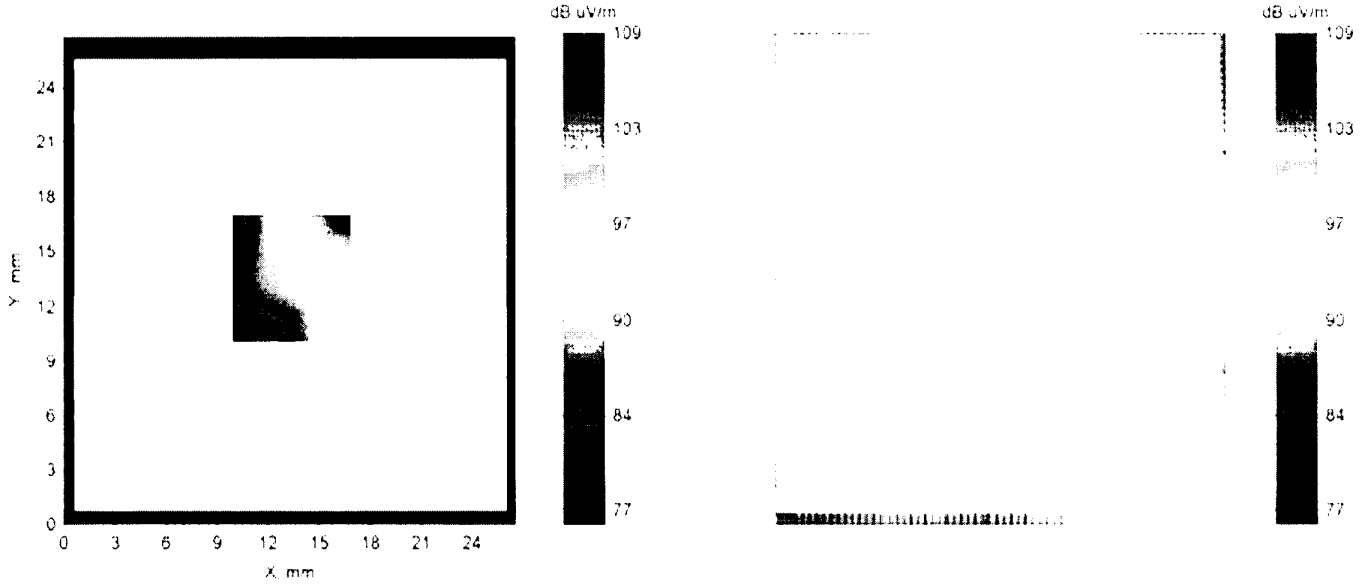

dB uV/m
109
103
97
90
84
77
Y mm
0
3
6
9
12
15
18
21
24
X mm
dB uV/m
109
103
97
90
84
77

FIG. 88

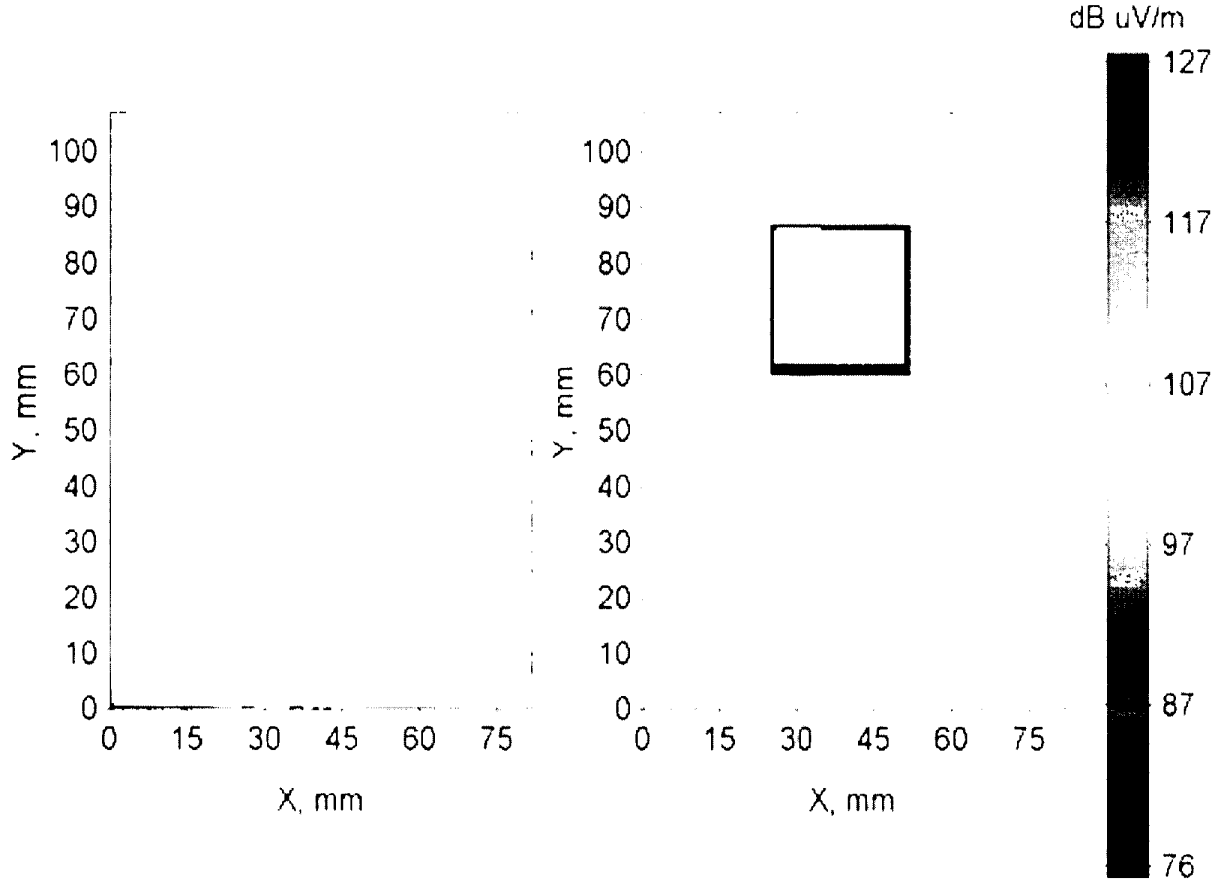
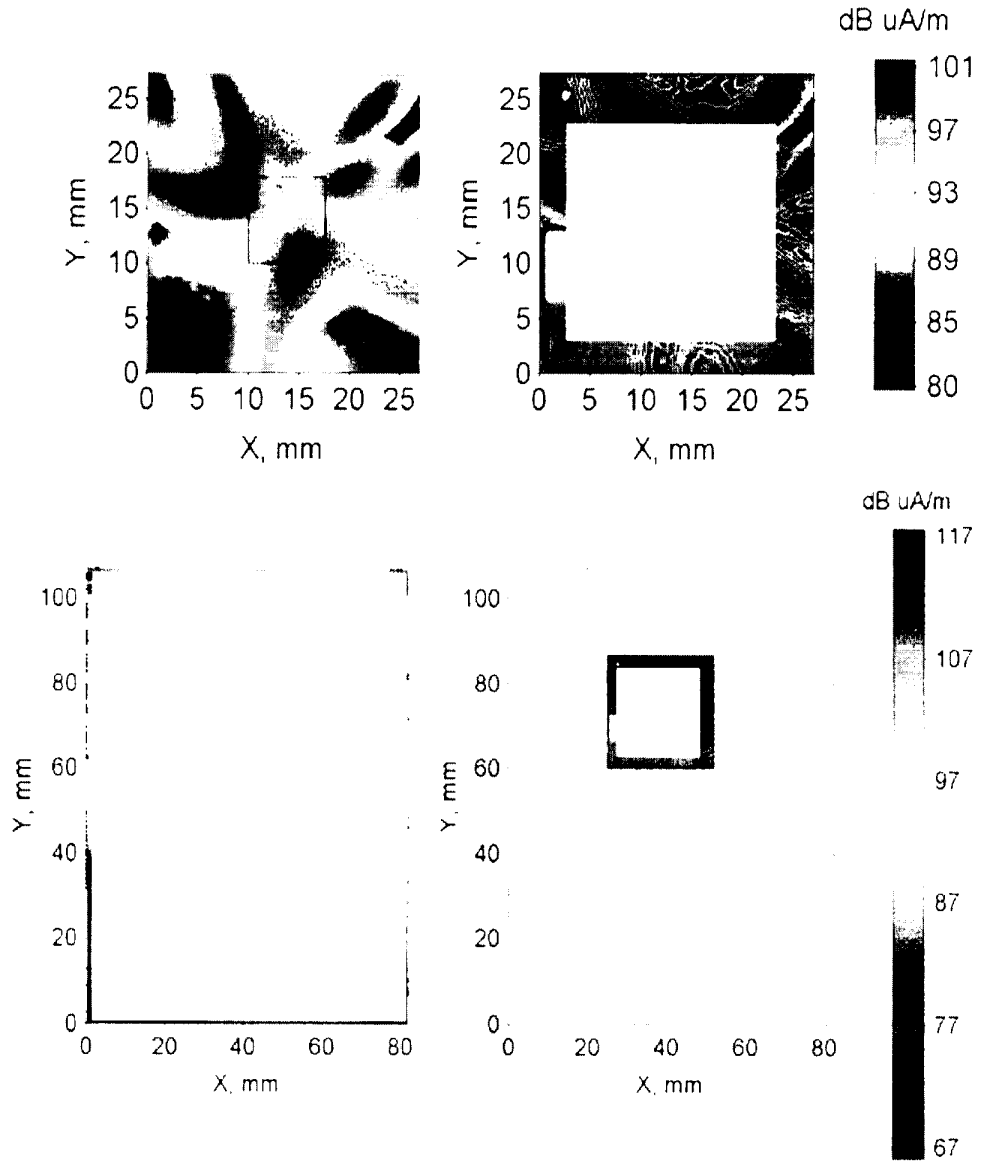

dB uV/m
127
117
107
97
87
76
Y, mm
X, mm
100
90
80
70
60
50
40
30
20
10
0
0
15
30
45
60
75

FIG. 89

FIG. 90


dB uA/m
101
97
93
89
85
80
Y, mm
X, mm
25
20
15
10
5
0
0 5 10 15 20 25
dB uA/m
117
107
97
87
77
67
100
80
60
40
20
0
0 20 40 60 80

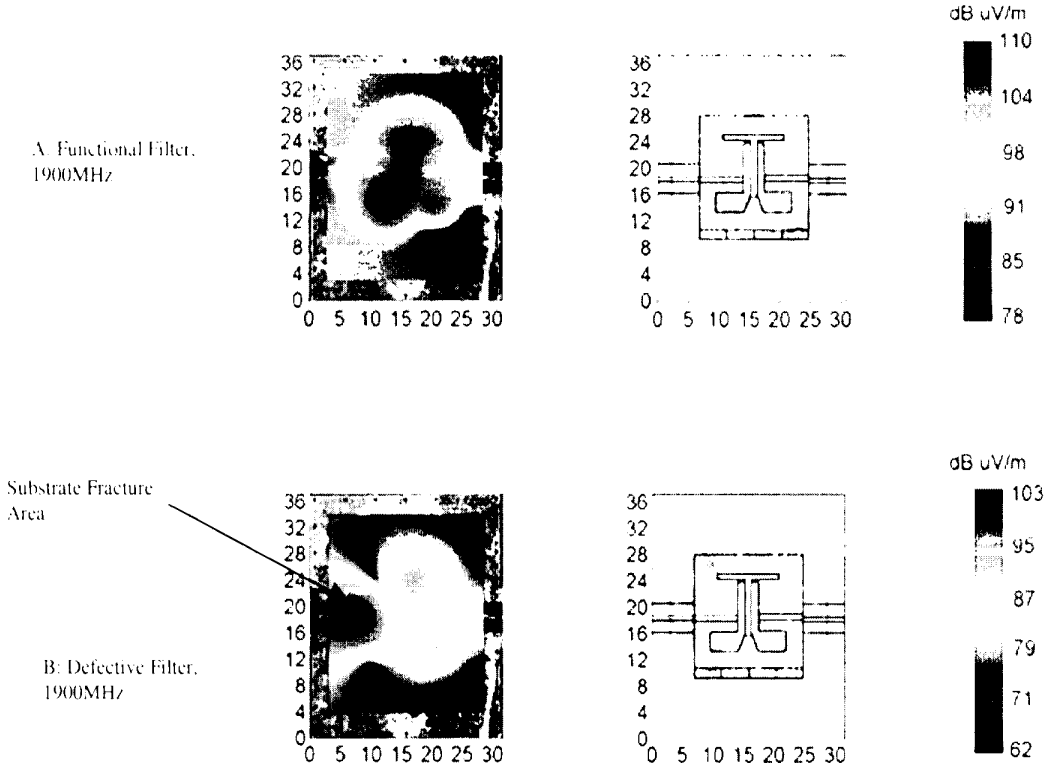
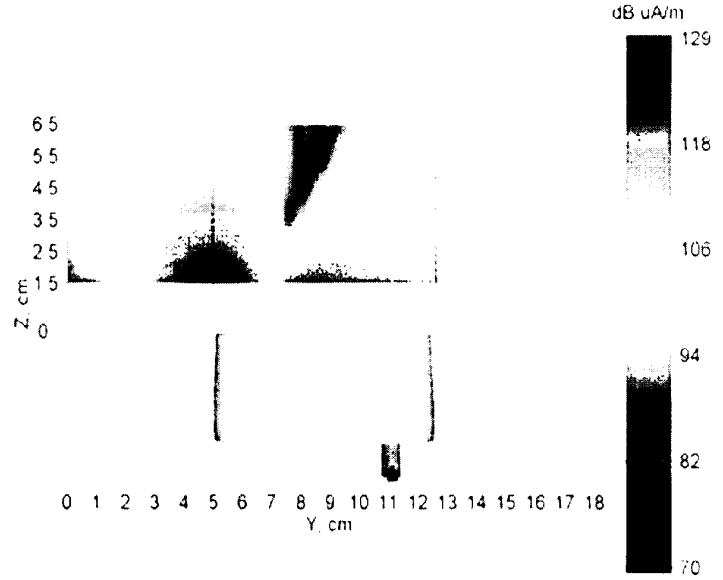
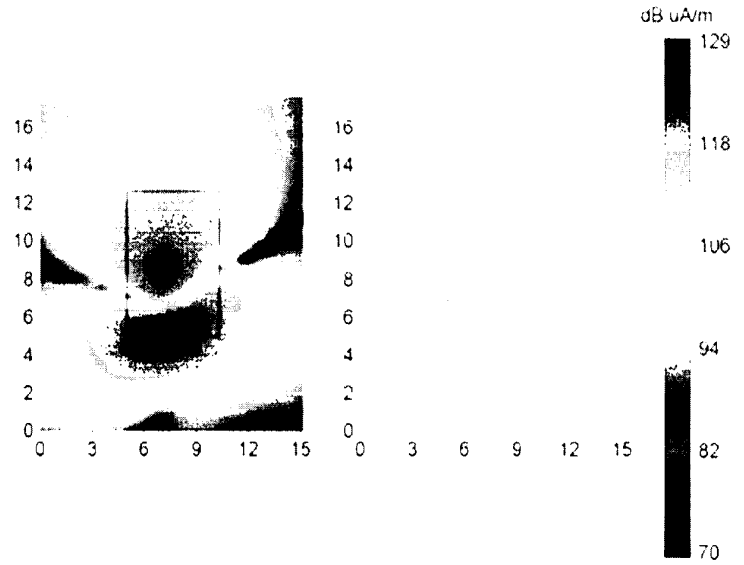

A: Functional Filter, 1900MHz
Substrate Fracture Area
B: Defective Filter, 1900MHz
dB uV/m
110
104
98
91
85
78
dB uV/m
103
95
87
79
71
62
0 5 10 15 20 25 30
36
32
28
24
20
16
12
8
4
0

FIG. 91

FIG. 92


dB uA/m
129
118
106
94
82
70
Z, cm
6.5
5.5
4.5
3.5
2.5
1.5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Y, cm


dB uA/m
129
118
106
94
82
70
16
14
12
10
8
6
4
2
0
0 3 6 9 12 15
0 3 6 9 12 15

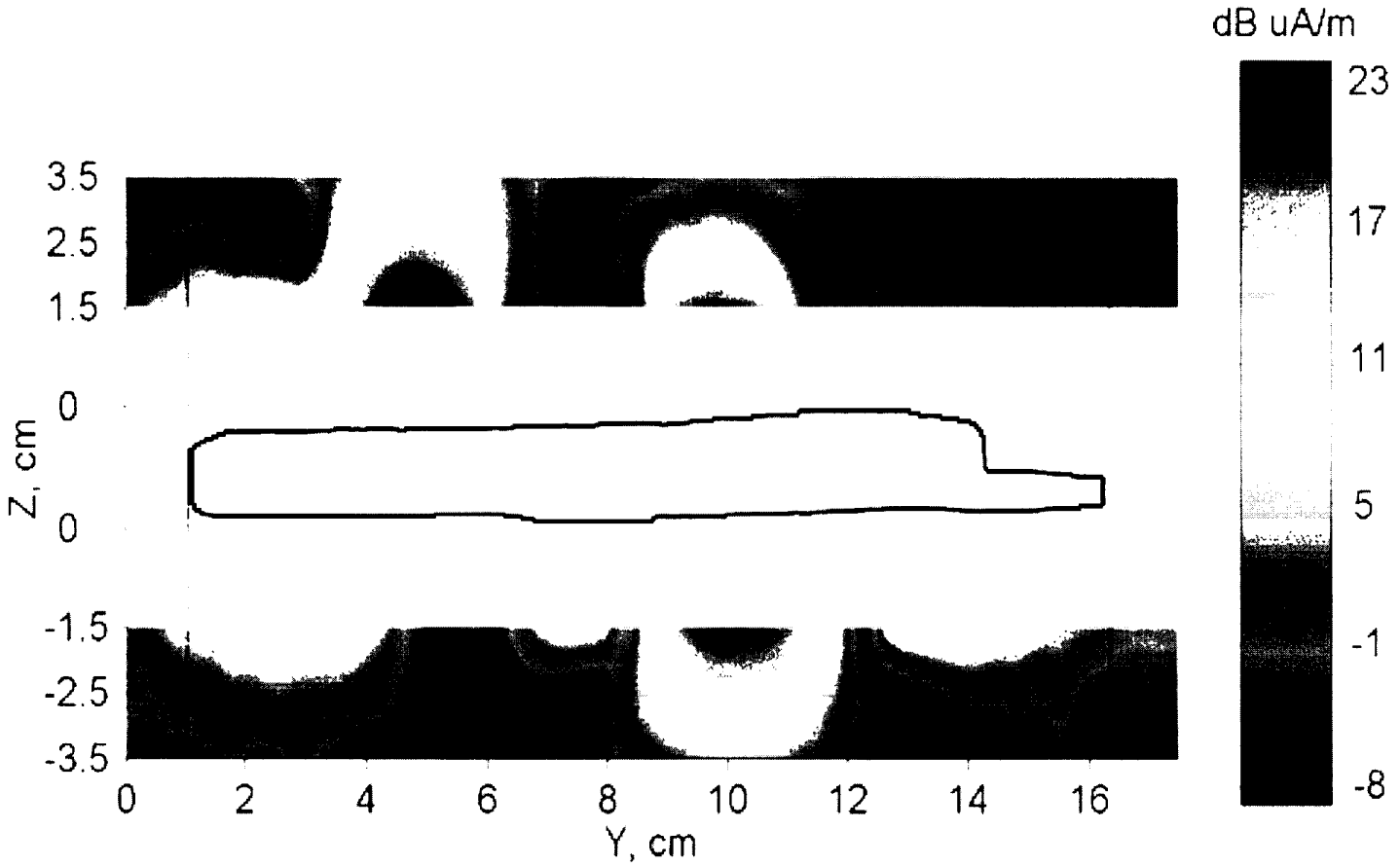
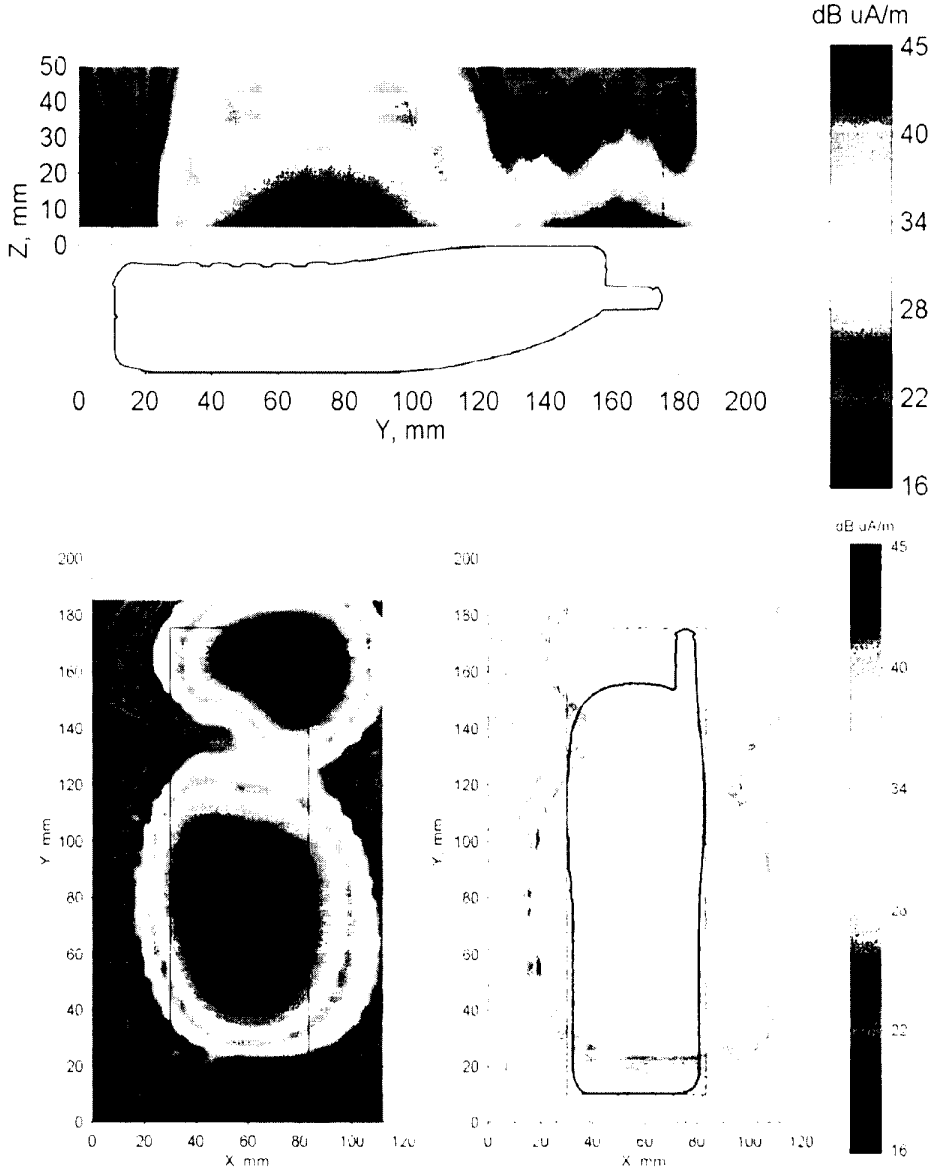


FIG. 93

FIG. 94


dB uA/m
45
40
34
28
22
16
Z, mm
50
40
30
20
10
0
0 20 40 60 80 100 120 140 160 180 200
Y, mm
Y mm
X mm
0 20 40 60 80 100 120
0 20 40 60 80 100 120 140 160 180 200

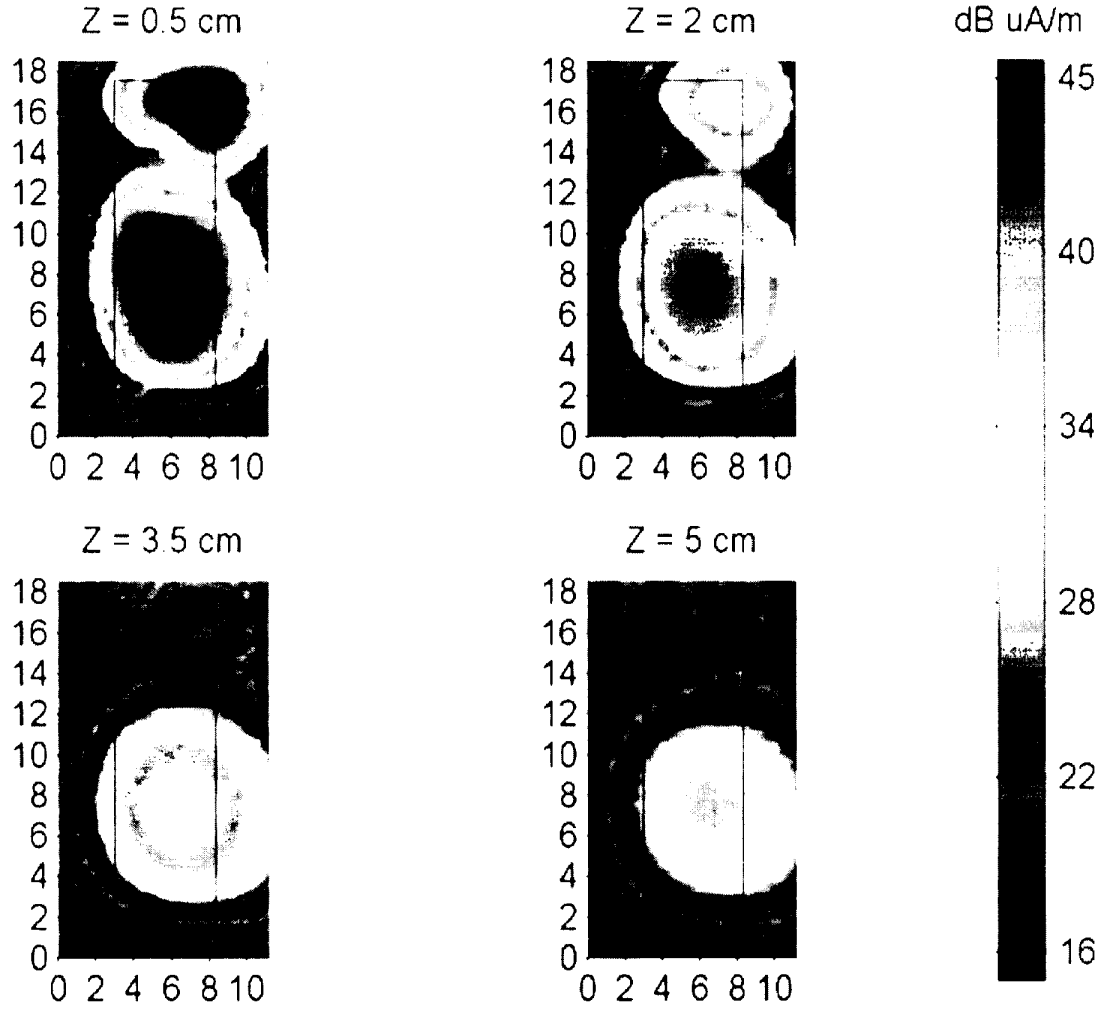

Z = 0.5 cm
Z = 2 cm
Z = 3.5 cm
Z = 5 cm
dB uA/m
45
40
34
28
22
16
0 2 4 6 8 10
0 2 4 6 8 10 12 14 16 18

FIG. 95

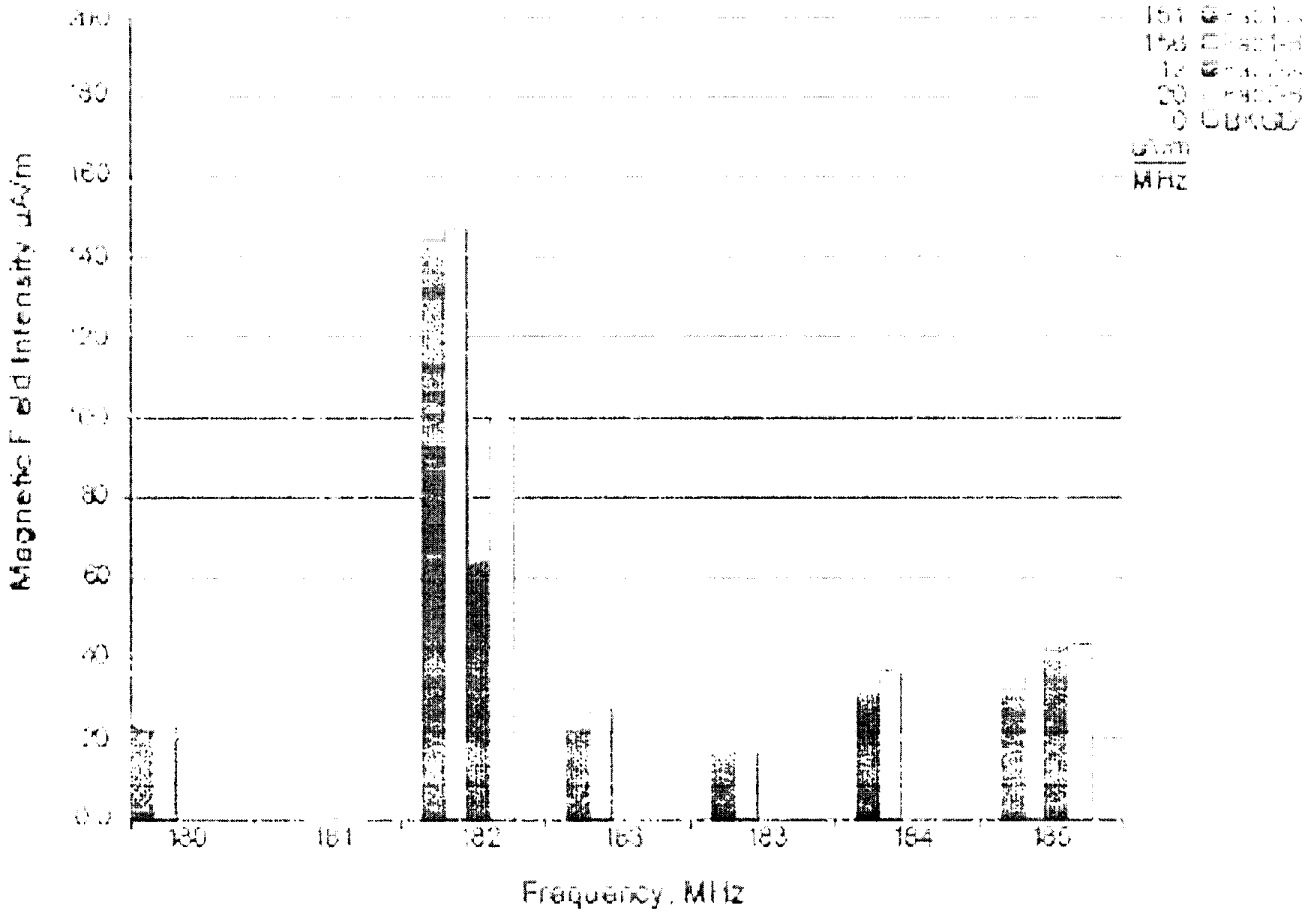

Magnetic Field Intensity uA/m
180
160
140
120
100
80
60
40
20
0
180
181
182
183
184
185
Frequency, MHz
MHz

FIG. 96

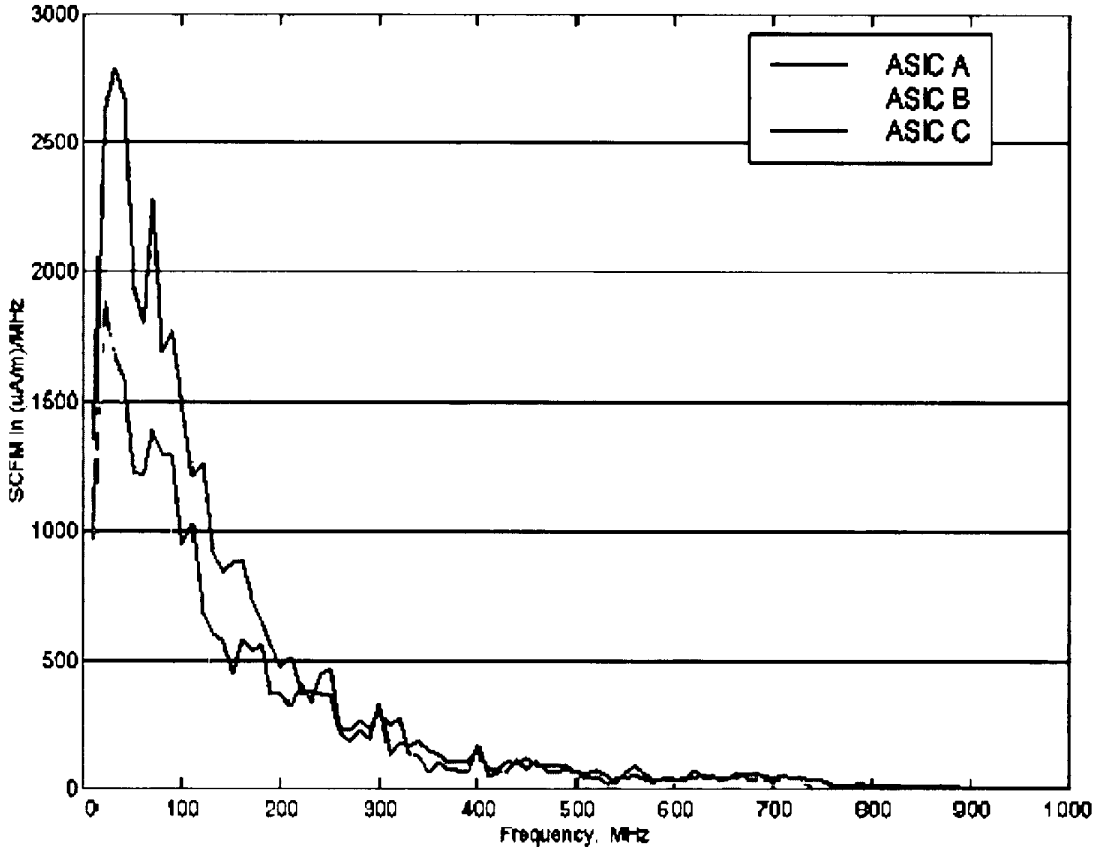

3000
2500
2000
1500
1000
500
0
SCFM in (uA/m)/MHz
0
100
200
300
400
500
600
700
800
900
1000
Frequency, MHz
ASIC A
ASIC B
ASIC C

FIG. 97

FIG. 98

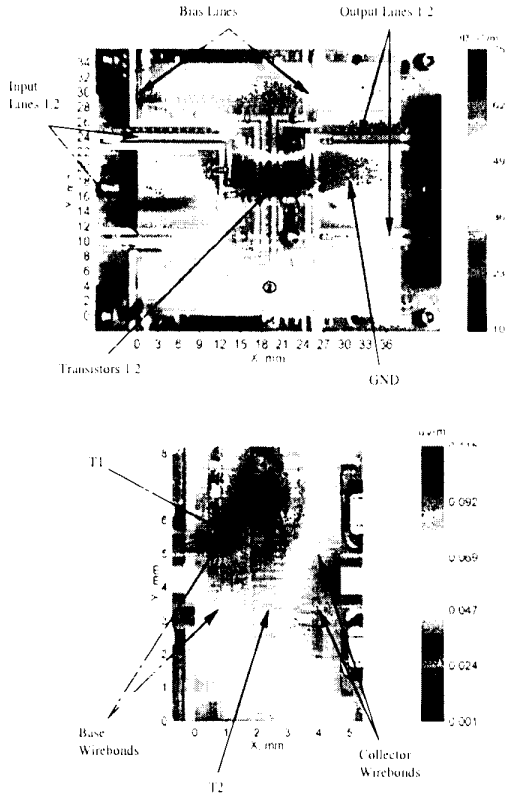

Bias Lines
Output Lines 1,2
Input
Lines 1,2
Transistors 1,2
GND
T1
T2
Base
Wirebonds
Collector
Wirebonds
0.092
0.069
0.047
0.024
0.001

FIG. 99

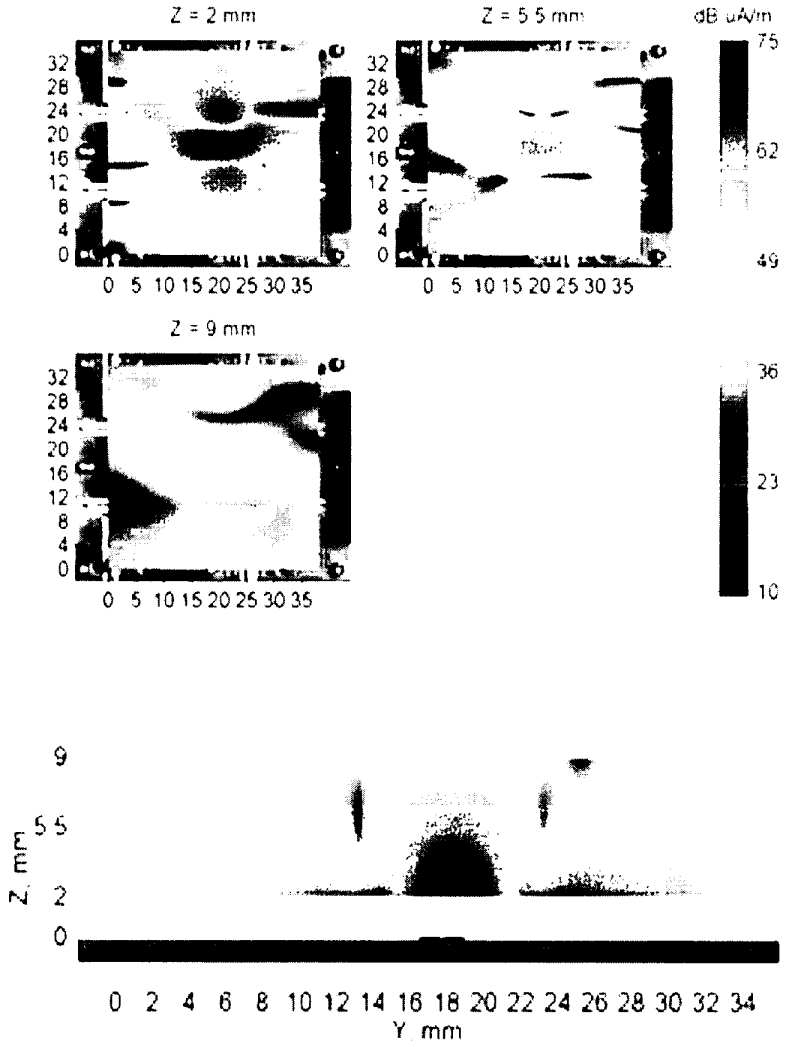
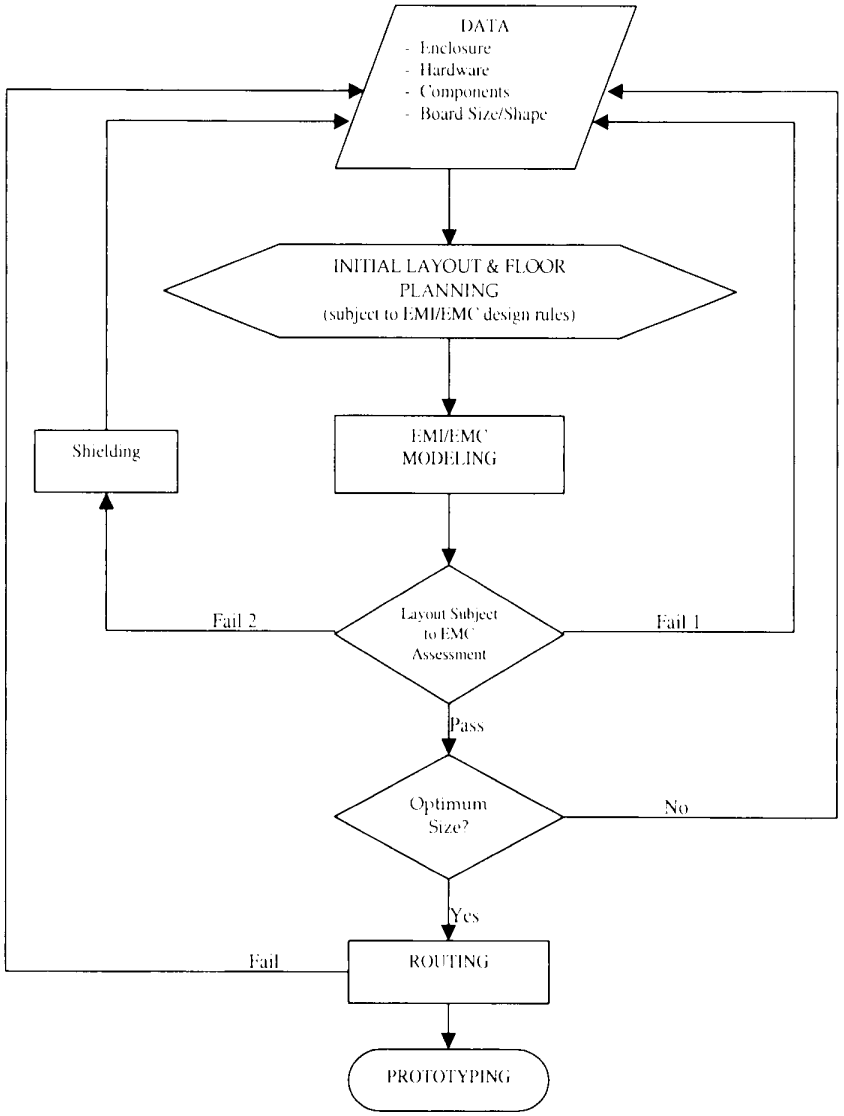

Z = 2 mm
Z = 5.5 mm
dB uA/m
75
62
49
Z = 9 mm
36
23
10
0 5 10 15 20 25 30 35
Z mm
9
5.5
2
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
Y mm

FIG. 100


DATA
- Enclosure
- Hardware
- Components
- Board Size/Shape
INITIAL LAYOUT & FLOOR PLANNING
(subject to EMI/EMC design rules)
EMI/EMC MODELING
Shielding
Layout Subject to EMC Assessment
Fail 2
Fail 1
Pass
Optimum Size?
No
Yes
ROUTING
Fail
PROTOTYPING